GOOGOL TECHNOLOGY

GUC-ECAT SERIES

USER'S GUIDE

Beta Version

2014.11

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Foreword

Thank you for selecting Googol Technology motion controller

To repay user, we will help you establish your own control system, by providing our first-class motion controller, perfect after-sale services, and high-efficiency technical support.

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Usage of this User's Guide

This guide will help the user understand the basic architecture of GUC-ECAT series of motion controllers, and learn how to install the motion controller, wire the controller with the motor control system and conduct the basic debugging of the motion control system.

Users of this User's Cuide

This guide is suitable for the one who have engineering background, basic hardware knowledge, and good understanding of motion control.

Main Contents of this Programming Manual

This guide consists of six chapters. Introduce constitute, installment, link, technical parameters, tuning, troubleshooting etc. of GUC-ECAT series Motion Controller in detail.

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Related documents

Programming with GUC-ECAT series motion controller, please refer "*Advanced Programming Manual of GUC-ECAT Series Motion Controller*" and " *Programming Manual of GUC-ECAT Series Motion Control Box*" provided together with our product.

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Chapter 1 Overview

1.1 Introduction

GUC-ECAT series motion controller is a combination of PC technology and motion control technology, which is developed based on CPU and chipset in Intel X86 architecture as the system processor, and use high performance DSP and FPGA as the motion control coprocessor. A GUC-ECAT series motion controller has full functions of a PC and Googol motion controllers, it not only widely applied in high speed point-to-point motion area and high-performance multi-axis synchronization motion areas, but also widely applied in common PC ,which makes it an ideal embedded development platform and can be applied to robotics, CNC machinery, carpentry machinery, printing machinery, assembly lines, laser processing and PCB milling machinery.

GUC-ECAT series motion controllers provided general ports (such as PS2, USB, VGA and LAN) and dedicated ports for motion control(The definitions of ports are given in Chapter 3). The C function library and Windows DLL are also provided to accomplish more complicated control functions. User may combine these control functions with the data processing, display interface, user interface and other application modules as required by some specific control system, to implement a control system of specific application requirements. To operate the motion controller, user is required to have the programming experience with C language or DLL in Windows environment.

No operating system is provided along with GUC –ECAT series motion controllers, please use authorized operating system.

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1.2 Model description

1.2.1 GUC-ECAT Series Motion Controllers

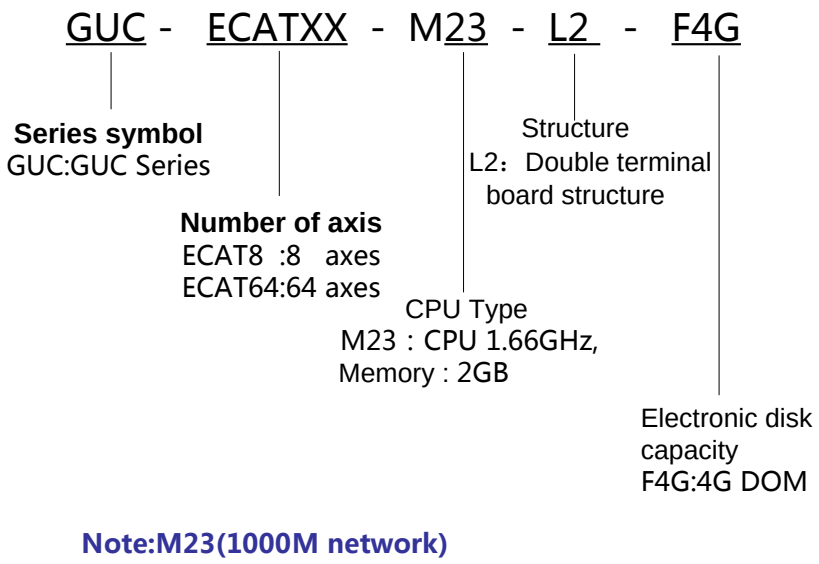

Fig 1-1 Model description of GUC-T series Motion Controllers

Common product model is illustrated in Fig 1-1, please refer to 3.1 for detailed description.

Tab 1-1 Standard model of GUC-ECAT

Model	Description
GUC-ECAT8-M23-L2-F4G	8 axes
GUC-ECAT64-M23-L2-F4G	64 axes

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1.2.2 Appearance of GUC-ECAT series motion controller

Fig 1-2 GUC-ECAT motion controller

1.3 Function description

Tab 1-2 Function list of GUC-ECAT 8/64 axes motion controller

√ **Included** **- Excluded** * **Optional**

Features		ECAT8	ECAT64
Sampling cycle	125 us (invariable)	√	√
Control cycle	250 us(invariable)	√	√
Analog output	Scale: -10V to +10V	√	√
Pulse output	Differential output	-	-
Encoder	4 channels(4 axes motion controllers) or 8 channels(8 axes motion controllers) of quadrupled frequency incremental encoder. Max. Counting frequency: 8 MHz (After quadrupled frequency)	-	-

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Features		ECAT8	ECAT64
Auxiliary encoder	2 channels(4 axes motion controllers)or 1 channel(8 axes motion controllers) of quadrupled incremental encoder; Max. Counting frequency: 8 MHz (After quadrupled).	√	√
Limit switch	Positive and negative limit switch of each axis with optical coupling isolation	√	√
Home switch	1 channel of home switch of each axis with optical coupling isolation	√	√
Driver alarm signal	1 channel of driver alarm signal of each axis with optical coupling isolation	√	√
Driver enable signal	1 channel of driver enable signal of each axis with optical coupling isolation	√	√
Driver reset signal	1 channel of driver reset signal of each axis with optical coupling isolation	√	√
Arrival digital signal input	1 channel of arrival digital signal of each axis with optical coupling isolation	√	√
General digital input	16 channels with optical coupling isolation	√	√
General digital output	16 channels with optical coupling isolation	√	√
Position compare output	2 channels(4 axes motion controllers)or 1 channel (8 axes motion controllers)differential position compare output signal(Note 1)	-	-
Point to Point motion	S-curve, T-curve, jog motion and electronic gear motion mode	√	√
Synchronic motion	Electric cam motion mode	*	*
PT motion	Position and time motion mode	*	*
PVT motion	Position, velocity and time motion mode	*	*
Interpolate motion	Linear interpolate motion	√	√
Analog input	Range: -10~+10V	*	*
Motion program	Directly run in motion controller	√	√
Filter	PID + Velocity feed-forward + Acceleration feed-forward	√	√
Extended module	Support digital module and analog module	√	√
Hardware capture	Index signal of encoder	√	√
	Home switch signal	√	√
	Probe signal(Note2)	-	-
Safety	Specify following error limit.	√	√
	Specify Output voltage saturation limit	√	√

Note 1: Position compare output please refer to 10.11 of "**Programming Manual of GUC-ECAT Series Motion Controller**".

Note 2: Probe capture please refer to 7.6 of "**Programming Manual of GTS Series Motion Controller**"

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Chapter 2 Quick Start

2.1 Open the Package and Check

Please check and make sure the product on your hand is identical with the model you purchased before opening the packages, which can be found on the package. When the package is open, please take on the antistatic gloves provided by Googol Technology to check the accessories and make sure they are complete and same with the “packing list” or order contract. Check and make sure no mechanical damage on the motion controller. If there is mechanical damage on the controller, or any item missed in the package, please do not use the product and contact with Googol Technology or our distributor immediately.

List of GUC-ECAT series 8/64 axes motion controller.

(1) One GUC- ECAT series motion controller;

(2) One product CD;

(3) One antistatic gloves;

(4) One Guarantee card;

(5) One Certification.

The list is for reference only, the actual term please refer to “packing list” or order contract.

2.2 Installation Site

Motion controller should be far away from equipment and environment with high-power and strong electromagnetic interference.

2.3 Preparation

Before installment, user has to prepare the following items:

(1) +24V DC power (can’t be replaced by ±12V direct supply);

(2) Servo motor;

(3) Driver and Power of GTHD-XXXXAEC2 series; (Currently supports driver of GTHD-XXXXAEC2 series only)

(4) The quantity of network cable between GUC-ECAT controller and driver is the driver quantity +1, user supplied;(Please use the cable which rating consistent with TLA/EIA-568 standard STP

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CAT-5E(UTP shielded wire or higher.)

(5) Home switch, positive/negative limit switches (optional as needed);

(6) Multimeter.

2.4 Installation Procedures

Step 1: Connect GUC motion controller with standard input/output device and +24V DC power. Turn on the power;

Step 2: Install operating system on the motion controller;

Step3: Install Windows drivers of the motion controller (only for Windows environment);

Step4: Establish communication between the host and the motion controller (only for Windows environment)

Step 5: Connect the motor with driver;

Step 6: Connect the controller with the servo drivers.

2.4.1 Step 1: Connect GUC motion controller with standard input/output device and +24V DC power. Turn on the power

GUC-ECAT series motion controllers provide standard I/O ports (VGA, PS2 and USB) that used to set up a PC system. Users could use these ports to connect general I/O devices such as monitor, keyboard, mouse, etc. A DC power (24V, 3A output at least) is necessary for the PC system, thus the POWER port is used to connect the DC power supply. Two LED lights are on after power on indicating that the GUC motion controller is in operation.

A PE (protect earth) port that connects with the shell of motion controller is also provided on the power port, with which users could connect external ground (shell, earth, etc.) and (or) internal ground (digital ground, +24V reference ground). Wiring of power is shown in Fig 2-1.

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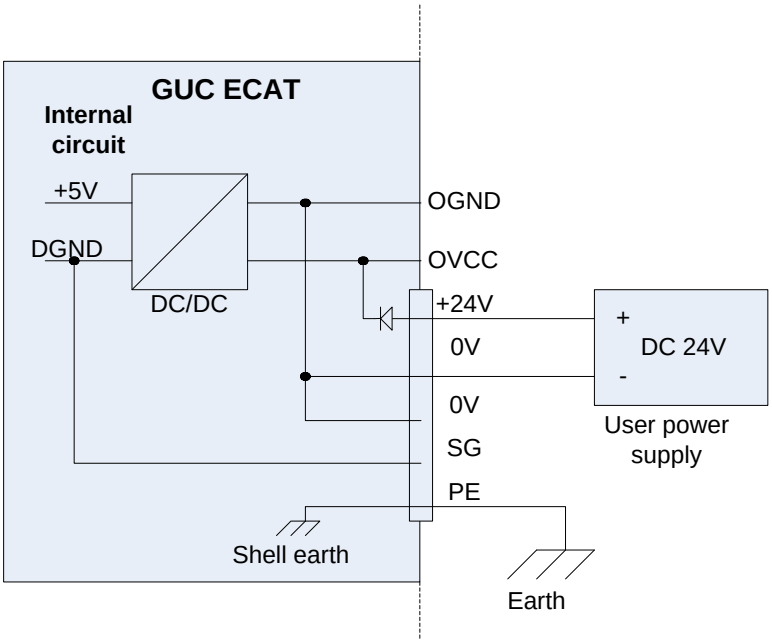

Fig 2-1 Wiring of GUC-ECAT power supply

CAUTION	To prevent electric shock and ensure normal operation of electric devices, please be sure to connect PE and earth.

2.4.2 Step 2: Install operating system on the motion controller

After turning on the power of GUC motion controller according **step1,** please check if the operating system is installed. If no, user has to install the operating system as described as follows, otherwise please go to **step 4** directly.

CAUTION	Attention. Please make sure backup the important data and files in the GUC motion controller before installing the operating system.

(1) Installation of Windows98/2000/XP

1) Prepare a USB CD-ROM and an installation CD of authorized Windows operating system.

2) Connect the USB CD-ROM with the GUC motion controller. Turn on the power.

3) Press DEL when starting the GUC motion controller to enter BIOS setting (Fig 2-2). Select **Advanced BIOS Features** and then press ENTER

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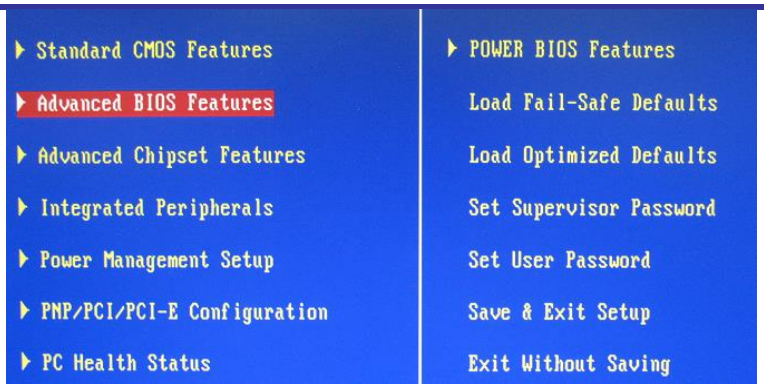

Fig 2-2 BIOS setting 1

4) In Fig 2-3, set **First Boot Device** to **USB-CDROM**

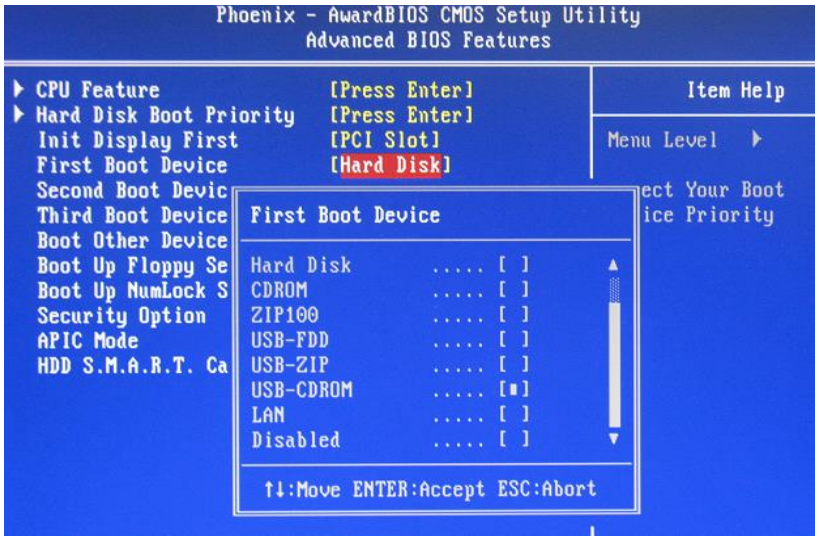

Fig 2-3 BIOS setting 2

5) Save BIOS setting. Restart the GUC motion controller and install operating system with the CD.

6) After the installation of operating system, please install drivers for Intel 852 chip and video card with the product CD. (Some operating system has already install the driver for video cared, to make sure display can startup normal after Illegal shutdown, it is suggested to install the driver as above).

7) Restart the GUC motion controller after the installation of driver is finished. By far the installation of operating system is finished.

CAUTION	Users should use authorized software of operating system. Googol Technology is not liable for the legal issues that results from using pirate software.

(2) Recovery of customized Windows C

CAUTION	Only if users require customized WINCE, the product CD provides GHOST.exe and WINCE.gho. No such files are provided in standard products. If users need customized WINCE, please contact with Googol Tech.

1) Prepare a USB disk can be used as startup disk (on how to make a startup disk, please refer to 6.3), and copy GHOST.exe and WINCE.gho in the CD provided by Googol Tech. to it.

2) Connect the USB disk with the GUC motion controller, and turn on the power.

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3) Press DEL when starting GUC motion controller to enter BIOS setting. Set **First Boot Device** to **USB-HDD** (please refer to BIOS setting).

4) Save BIOS setting and restart GUC motion controller.

5) When GUC motion controller enter DOS interface, as shown in Fig 2-4, enter “ghost”, press “enter” to enter GHOST installation interface (Fig 2-5).

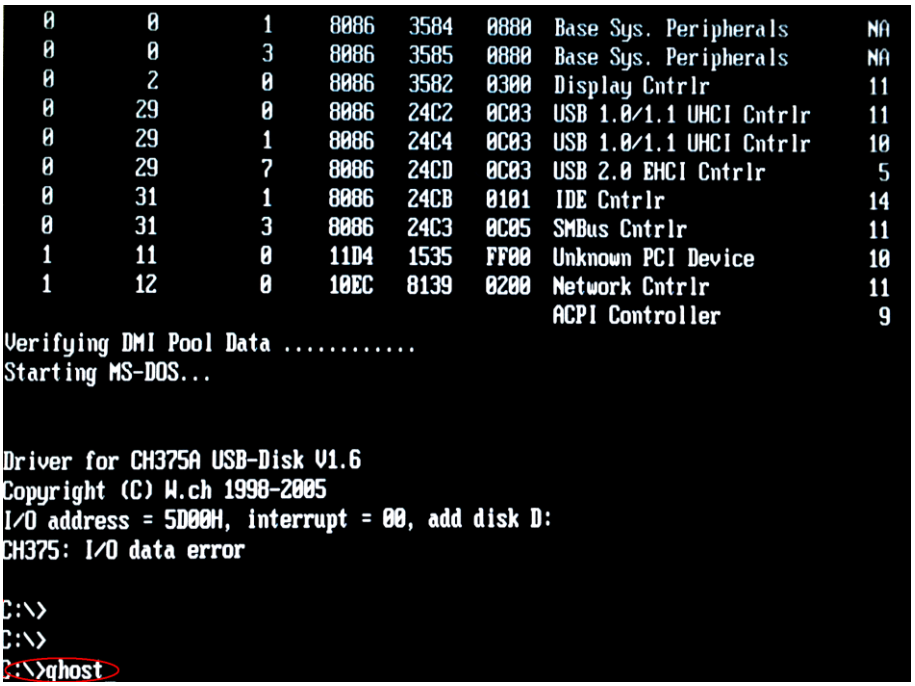
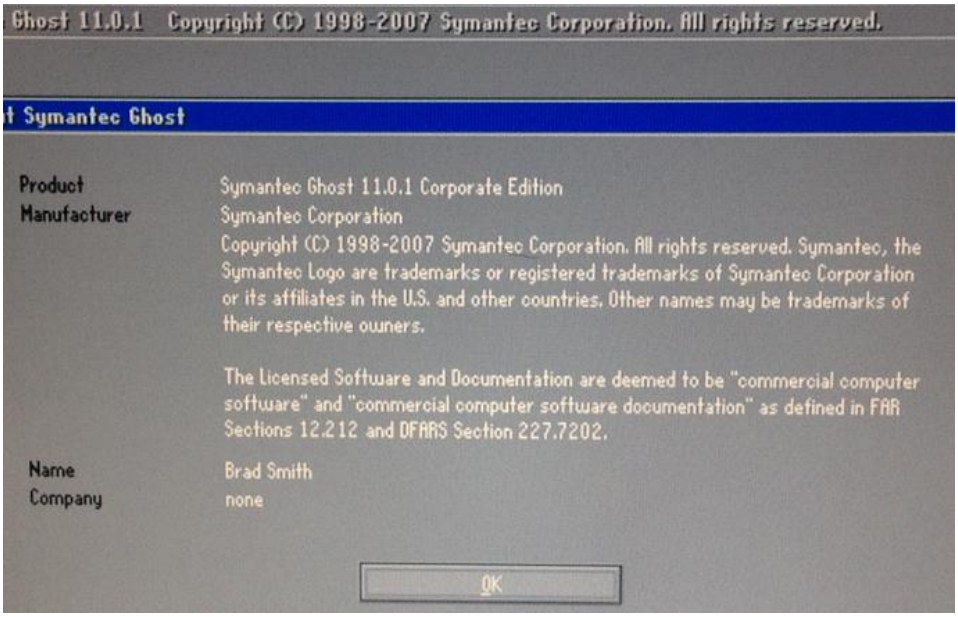

0 0 1 8086 3584 0880 Base Sys. Peripherals NA
0 0 3 8086 3585 0880 Base Sys. Peripherals NA
0 2 0 8086 3582 0300 Display Cntrlr 11
0 29 0 8086 24C2 0C03 USB 1.0/1.1 UHCI Cntrlr 11
0 29 1 8086 24C4 0C03 USB 1.0/1.1 UHCI Cntrlr 10
0 29 7 8086 24CD 0C03 USB 2.0 EHCI Cntrlr 5
0 31 1 8086 24CB 0101 IDE Cntrlr 14
0 31 3 8086 24C3 0C05 SMBus Cntrlr 11
1 11 0 11D4 1535 FF00 Unknown PCI Device 10
1 12 0 10EC 8139 0200 Network Cntrlr 11
ACPI Controller 9
Verifying DMI Pool Data .....
Starting MS-DOS...
Driver for CH375A USB-Disk V1.6
Copyright (C) W.ch 1998-2005
I/O address = 5D00H, interrupt = 00, add disk D:
CH375: I/O data error
C:\>
C:\>
C:\>ghost

Fig 2-4 Enter “ghost” in dos interface


Ghost 11.0.1 Copyright (C) 1998-2007 Symantec Corporation. All rights reserved.
t Symantec Ghost
Product Symantec Ghost 11.0.1 Corporate Edition
Manufacturer Symantec Corporation
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The Licensed Software and Documentation are deemed to be "commercial computer software" and "commercial computer software documentation" as defined in FAR Sections 12.212 and DFARS Section 227.7202.
Name Brad Smith
Company none
OK

Fig 2-5 Installation interface of GHOST

6) Click “ok” and enter Fig 2-6.

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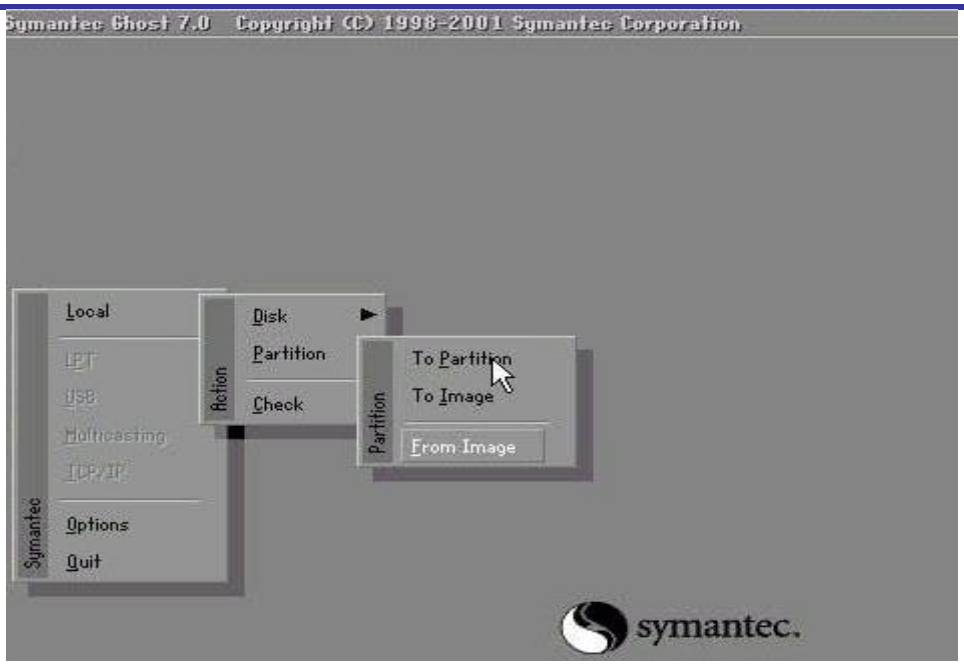

Fig 2-6 Installation interface of GHOST

7) Select "Local"->"Disk"->"Form Image", press enter, select "*.gho"(as shown in Fig 2-7).

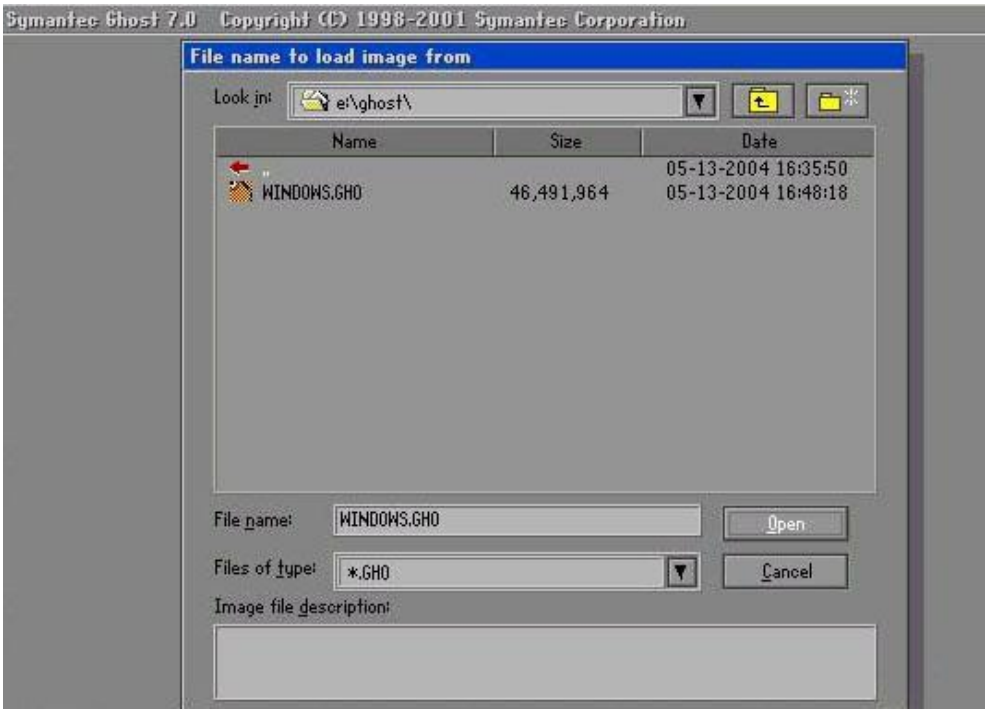

Fig 2-7 Select "*.gho" file

8) After loading "*.GHO" file, it will appear dialog box as shown in Fig 2-8, select DOM a disk (GUC-T provide a 1G or 4G DOM disk, user should distinguish it by the size).

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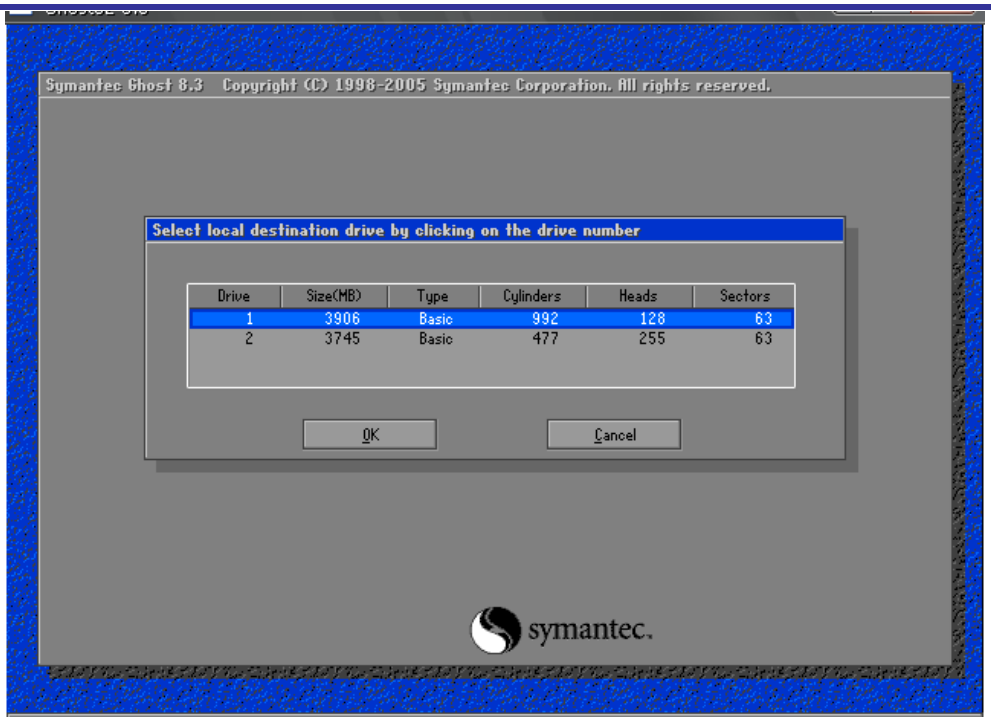
Symantec Ghost 8.3 Copyright (C) 1998-2005 Symantec Corporation. All rights reserved.
Select local destination drive by clicking on the drive number
Drive Size(MB) Type Cylinders Heads Sectors
1 3906 Basic 992 128 63
2 3745 Basic 477 255 63
OK
Cancel
symantec.

Fig 2-8 Select local destination driver

9) Click “OK”, the destination drive details dialog box appears as shown in Fig 2-9.

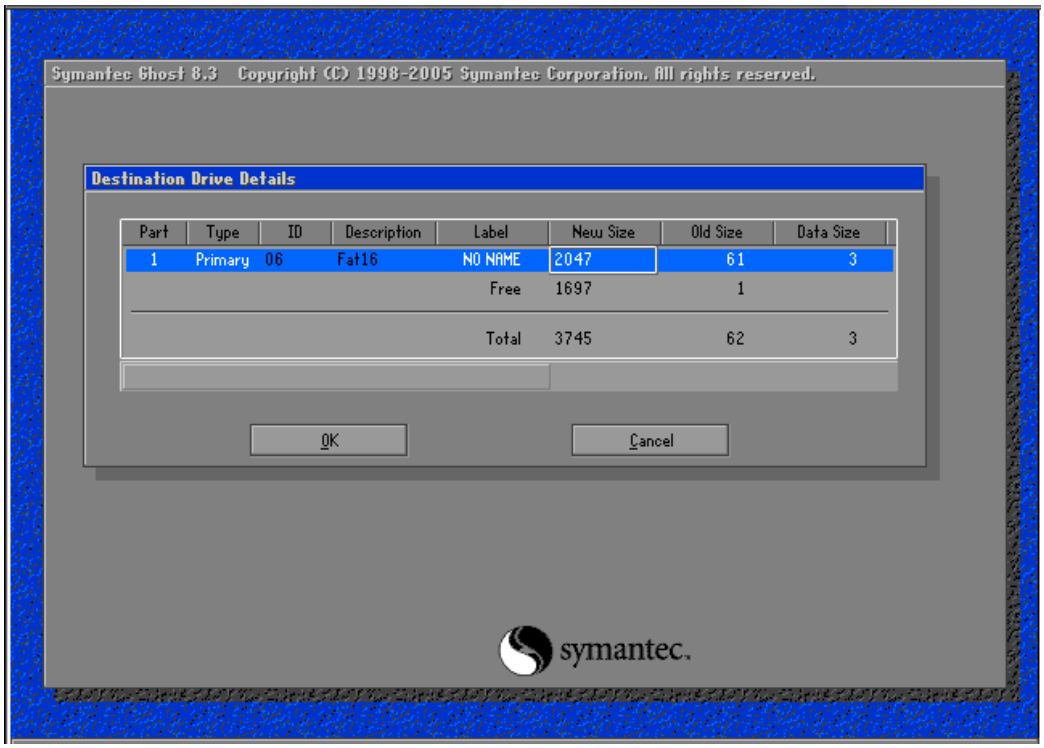
Symantec Ghost 8.3 Copyright (C) 1998-2005 Symantec Corporation. All rights reserved.
Destination Drive Details
Part Type ID Description Label New Size Old Size Data Size
1 Primary 06 Fat16 NO NAME 2047 61 3
Free 1697 1
Total 3745 62 3
OK
Cancel
symantec.

Fig 2-9 Destination drive details

10) Click “OK”, the question dialog box appears (as shown in Fig 2-10).

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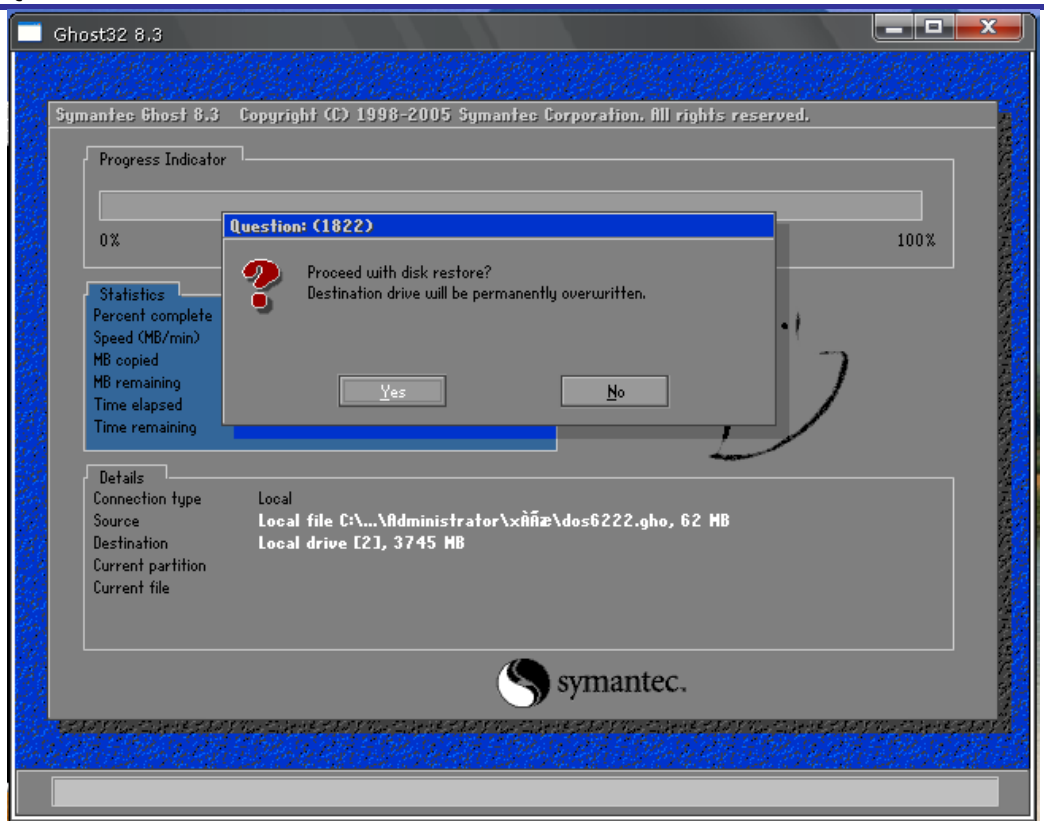

Fig 2-10 Confirm install dialog box

11) Click “Yes” and enter the Installation process interface.

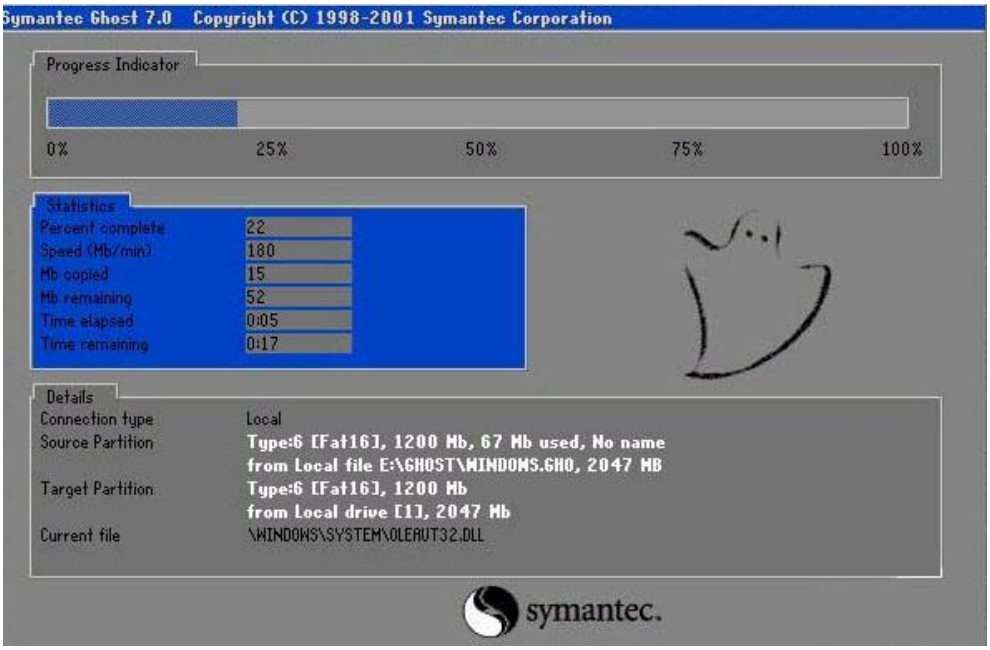

Fig 2-11 System installation process interface

12) After installation, it will appear dialog box as shown in Fig 2-12.

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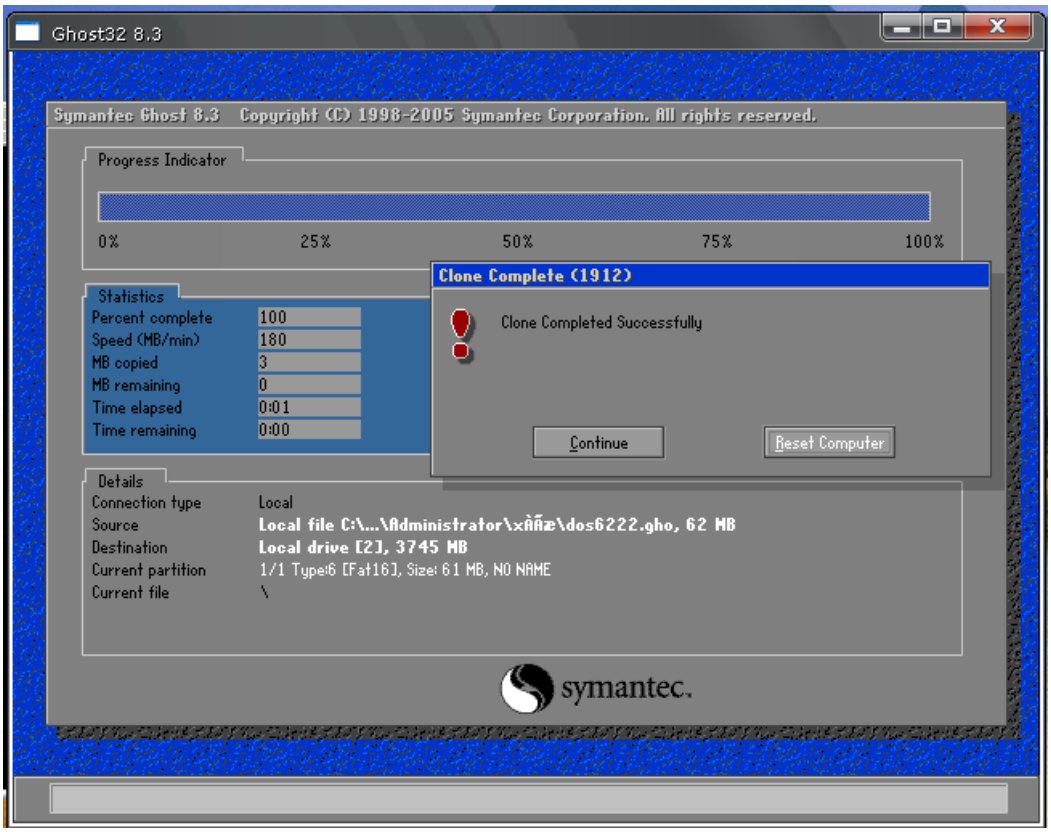

Fig 2-12 Completed installation dialog box

13) Extract USB disk, click “Reset Computer” to restart the computer and enter the WINCE interface.

2.4.3 Step3: Install Windows drivers of the motion controller (only for Windows environment)

For DOS or WINCE operating system, please go to **step4** directly

Install Windows drivers of the motion controller (only for Windows environment）

1) After installing hardware and starting computer, Windows will automatically detect the motion controller, select “Install from a list or specific location(Advanced)”, click “Next”.As shown below.

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Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
PCI Device
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Fig 2-13 Found new hardware wizard dialog box

2) A Select “Don’t search. I will choose the driver to install”. Click “Next”. The panel as shown in Fig 2-14.

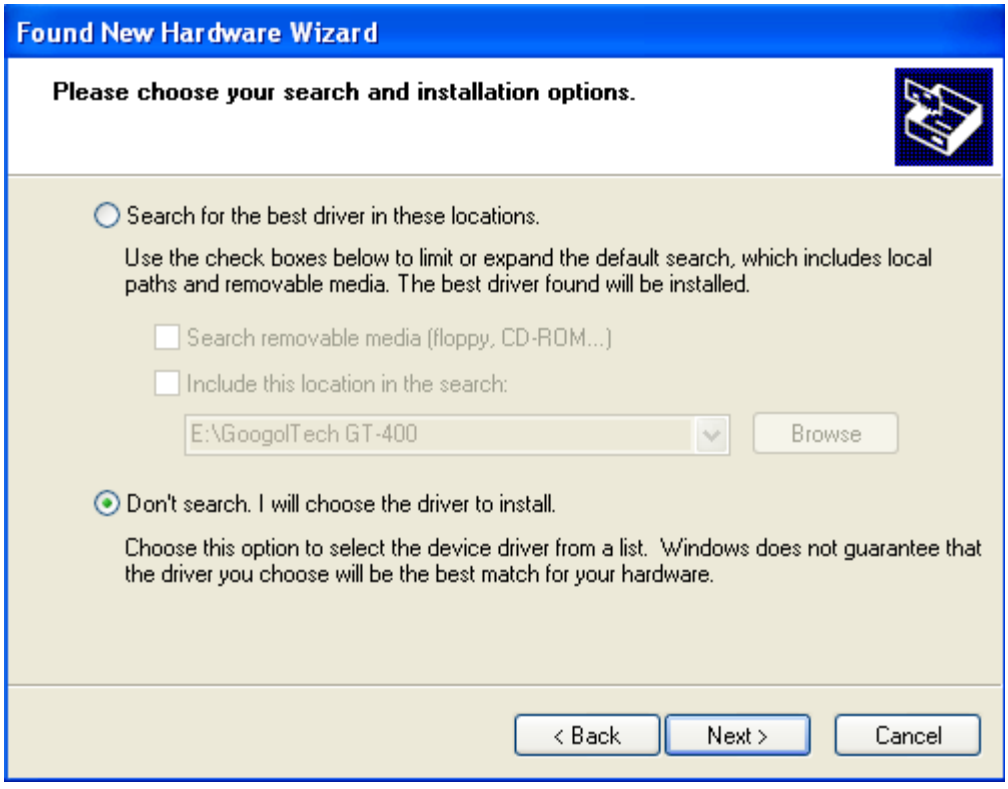
Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
E:\GoogolTech GT-400
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

Fig 2-14 Automatically or manually find drivers dialog box

3) After the previous step, the dialog box is to select the hardware model as shown in Fig 2-15.

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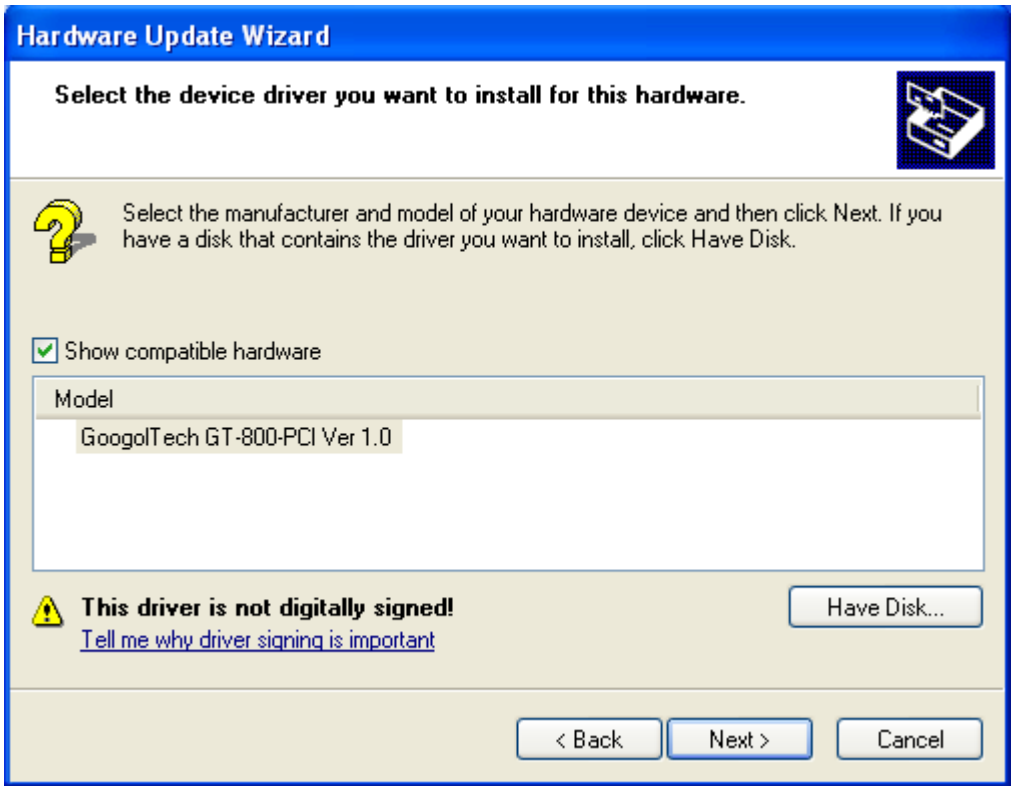
Hardware Update Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Show compatible hardware
Model
GoogolTech GT-800-PCI Ver 1.0
This driver is not digitally signed!
Tell me why driver signing is important
Have Disk...
< Back
Next >
Cancel

Fig 2-15 Hardware model selection

4) As shown in Fig 2-16, click “Have disk”, then click “Browse…” and choose GT800.INF in the path of “\Windows\Driver”.

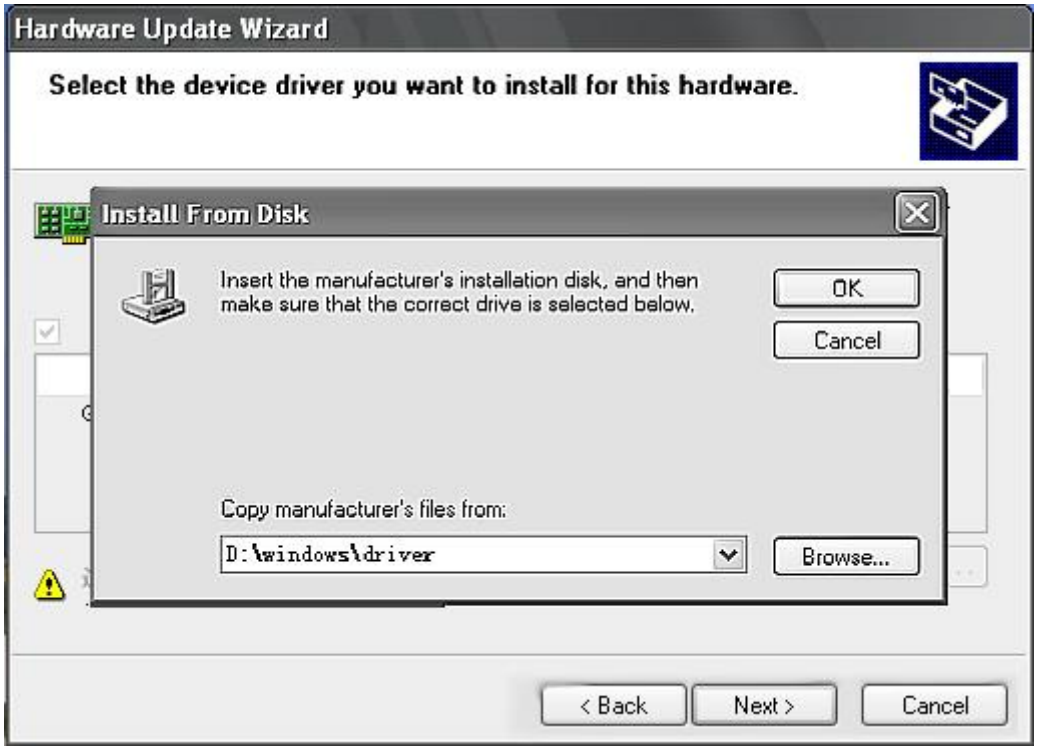
Hardware Update Wizard
Select the device driver you want to install for this hardware.
Install From Disk
Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.
OK
Cancel
Copy manufacturer's files from:
D:\windows\driver
Browse...
< Back
Next >
Cancel

Fig 2-16 Find drivers path dialog box

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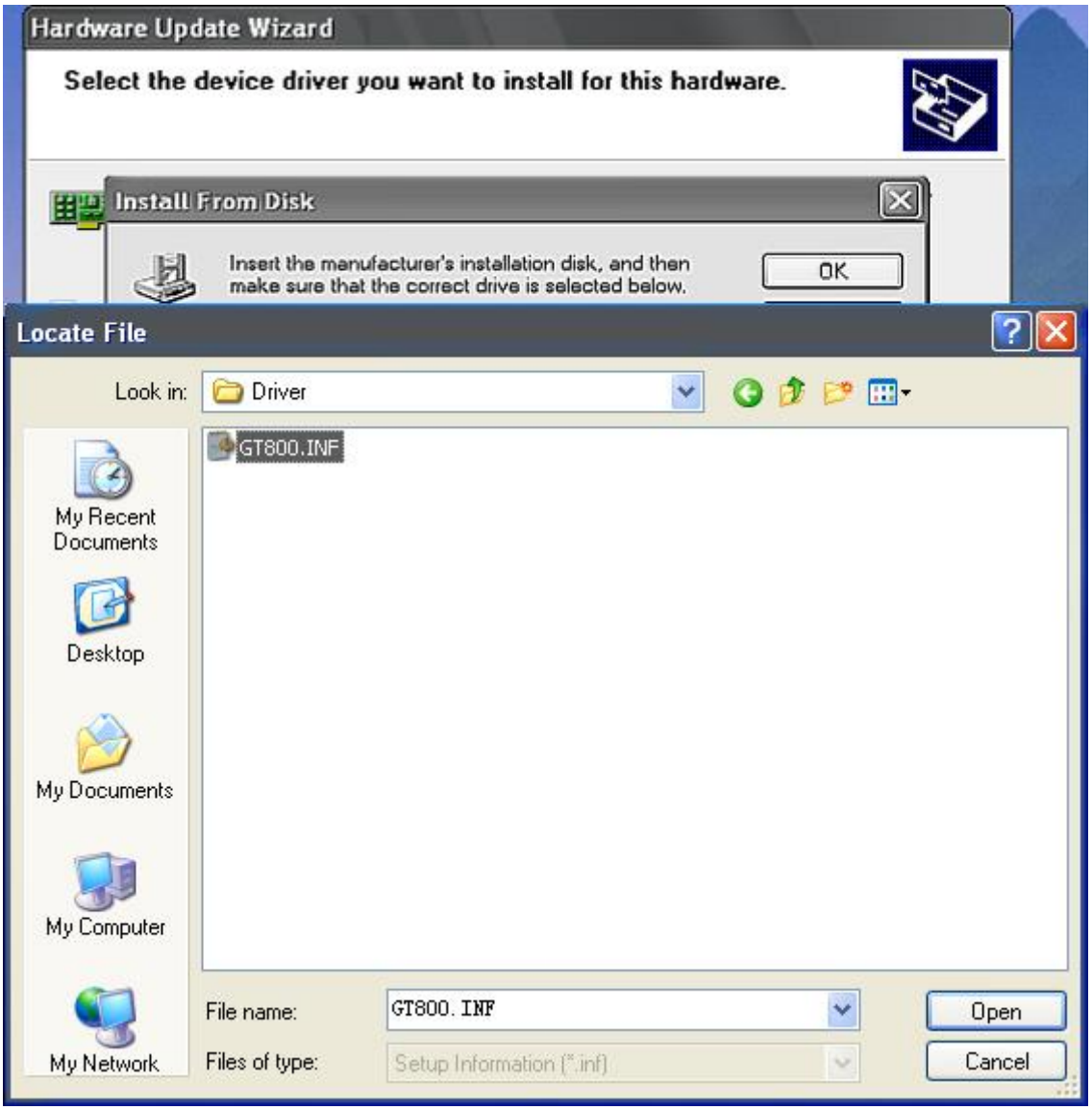

Fig 2-17 Select the driver dialog box

5) Select “GT800.INF”, click “Open”, as shown in Fig 2-17, it will turn to new dialog box as shown in Fig 2-16. Click “OK”, the wizard will automatically install the driver.Click “Finish” to complete the driver installation, as shown in Fig 2-18.

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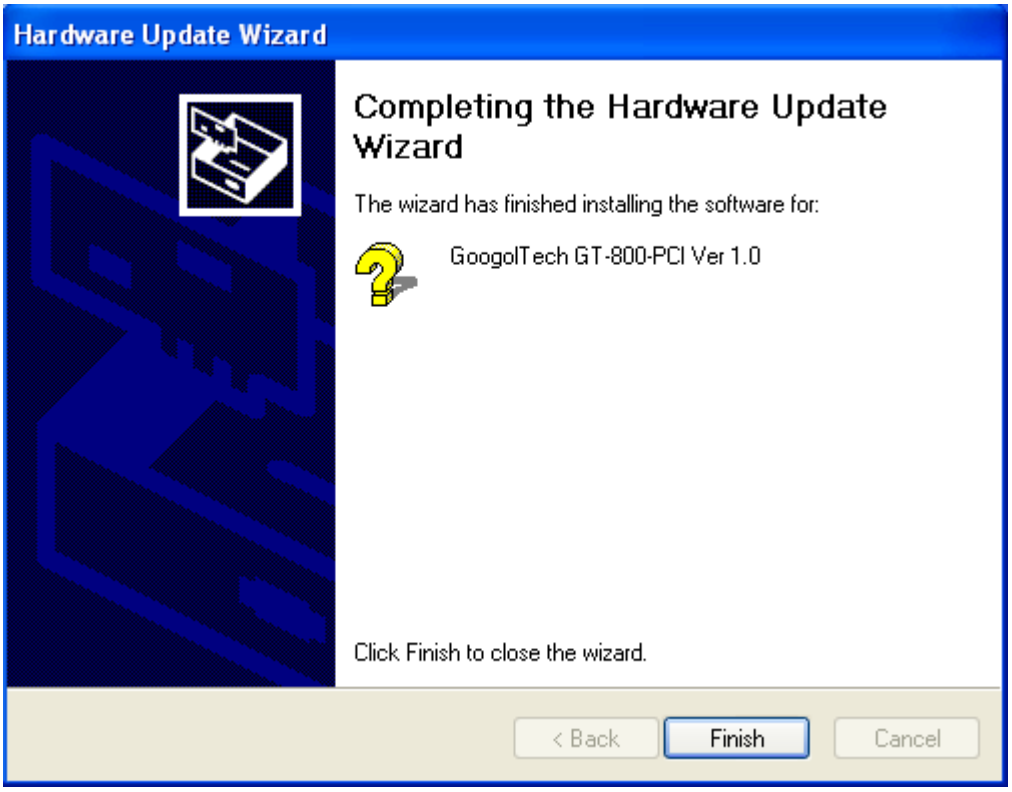

Fig 2-18 Driver installation completes dialog box

2.4.4 Step4: Establish communication between the host and the motion controller (only for Windows environment)

For DOS operating system, please go to **step5** directly.

For user who use GUC-ECATXX-M23-L2-F4G series motion controller, please use the included software to test the communication of host and motion controller.

Normal run of the testing software proves that the communication between the host and the motion controller is established successfully; otherwise it will pop up the message box “Connect to controller failed”, please refer to “Troubleshooting”, confirm what the trouble is, try again after trouble handled. If needed, please contact us.

2.4.5 Step 5: Connect the motor with driver

CAUTION	For safety, we strongly suggest that user do not connect the motor with any mechanical device before installing and debugging the whole control system. Please check that there is no load with the motor. After setting proper parameters of driver and card and motor is under control, mechanical device could be connected, otherwise, it may cause serious consequential damages.

Before connecting with the motor, please make sure the driver is not connected with the motion controller.Users must read the detailed instructions of driver and ensure proper connection. Test driver

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and motor according to the manual to ensure that they work properly.

2.4.6 Step 6: Connect the controller with the servo drivers

Turn off the power.Connect the GUC-ECAT controller with the servo drivers using the prepared network cable.

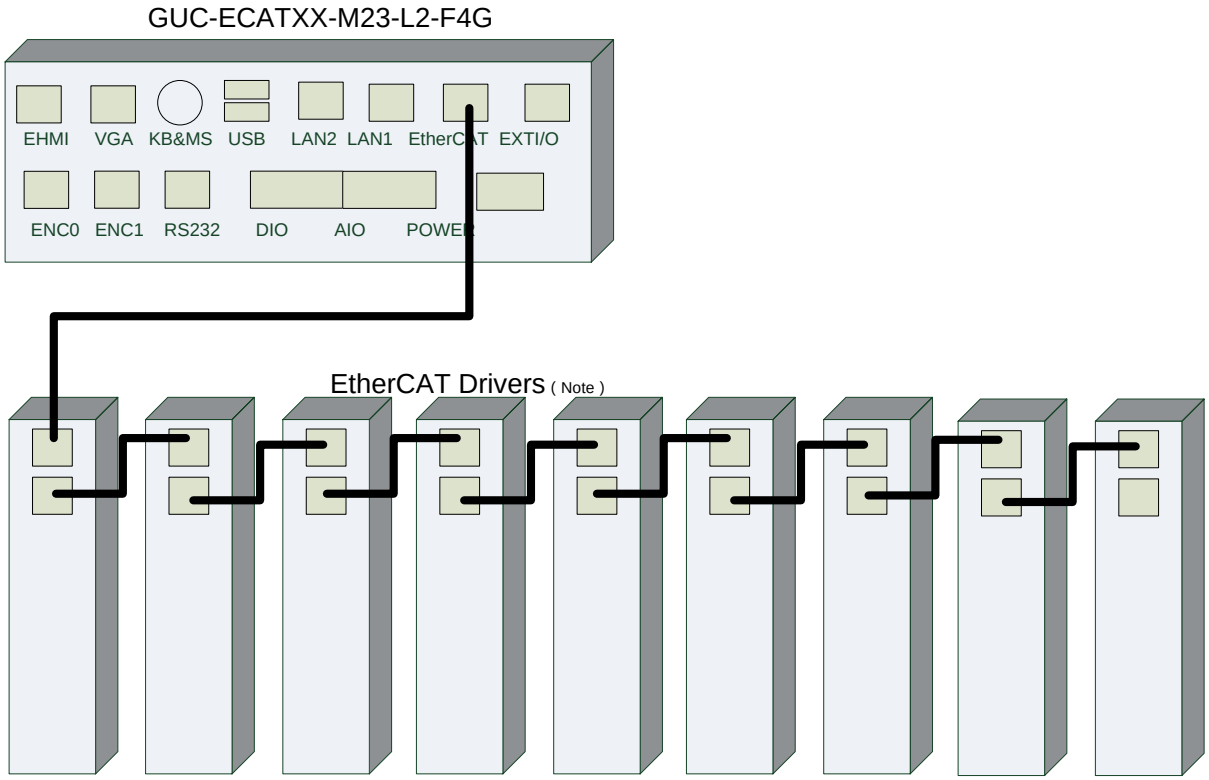

Fig 2-19 Connection between GUC-ECATXX-M23-L2-F4G and EtherCATdrivers

Note：Currently supports driver of GTHD-XXXXAEC2 series only. Other driver device support EtherCAT standard will be increased later.

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Chapter 3 Hardware connection

3.1 Controller type description

GUC-ECAT**XX**-M23-L2-F4G series motion controllers are universal EhterCAT network-based motion controllers for 8 axes and 64 axes. Two types controllers are shown in Tab 3-1, and the controller ports are shown inTab 3-2, Tab 3-3.

Tab 3-1 GUC-ECATXX-M23-L2-F4G controller type description

Controller types	Type description
GUC-ECAT8-M23-L2-F4G	✓ GUC-ECAT function; ✓ EtherCAT 8 axes（250us communication cycle）function; ✓ Kilomega network display; ✓ Double Ethernet; ✓ 8 channels digital input/output; ✓ 8 channels 12bit analog input; ✓ 2 channels 12bit analog output; ✓ 2 channels auxiliary encoder.
GUC-ECAT64-M23-L2-F4G	✓ GUC-ECATfunction； ✓ EtherCAT 64axes（4mscommunication cycle）function; ✓ Kilomega network display; ✓ Double Ethernet; ✓ 8 channels digital input/output; ✓ 8 channels 12bit analog input ✓ 2 channels 12bit analog output; ✓ 2 channels auxiliary encoder.

Controller types description:

HD：（1）Kilomega network display, can connected to Googol Special display;

（2）Double Ethernet,100M/1000M, adaptable.

ECAT: comply with EtherCAT agreement. Please use the cable which rating consistent with TLA/EIA-568 standard STP CAT-5E(UTP shielded wire) or higher to connect to the fieldbus network..The interface type is standard RJ45.

● GUC-ECAT8-M23-L2-F4G

Tab 3-2 GUC-ECAT8-M23-L2-F4G motion controller ports

Port	Function
eHMI	Kilomega network display port
VGA	VGA
KB/MS	Keyboard/Mouse

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USB	Double-layer USB
LAN1、LAN2	Dual Ethernet(1000M)
RS232	General purpose COM.
EXT I/O	High speed IO extension port.
ENC0、ENC1	Two auxiliary encoder interface
DI\DO	8 channels general input/output （flexible configuration）.
AI\AO	**8** channels **12bit analog input and 2** channels **12bit analog output**
EtherCAT	**Standard EtherCAT interface, control 8 axes in 250us communication cycle.**
POWER	Power

- **GUC-ECAT64-M23-L2-F4G**

Tab 3-3 GUC-ECAT8-M23-L2-F4G motion controller ports

Port	Function
eHMI	Kilomega network display port.
VGA	VGA
KB/MS	Keyboard/Mouse
USB	Double-layer USB
LAN1、LAN2	Dual Ethernet(1000M)
RS232	General purpose COM
EXT I/O	High speed IO extension port.
ENC0、ENC1	Two auxiliary encoder interface
DI\DO	8 channels general input/output （flexible configuration）
AI\AO	**8** channels **12bit analog input and 2** channels **12bit analog output**
EtherCAT	**Standard EtherCAT interface, control 64 axes in 4ms communication cycle.**
POWER	Power

3.2 Definition of special interface

GUC-ECAT controller provides all types of general interface and Special interface, general interface: VGA, KB&MS, USB, LAN, RS232, this user manual will not introduce these interface. The special interface is shown in Fig 3-1 and the definition is shown in Tab 3-4.

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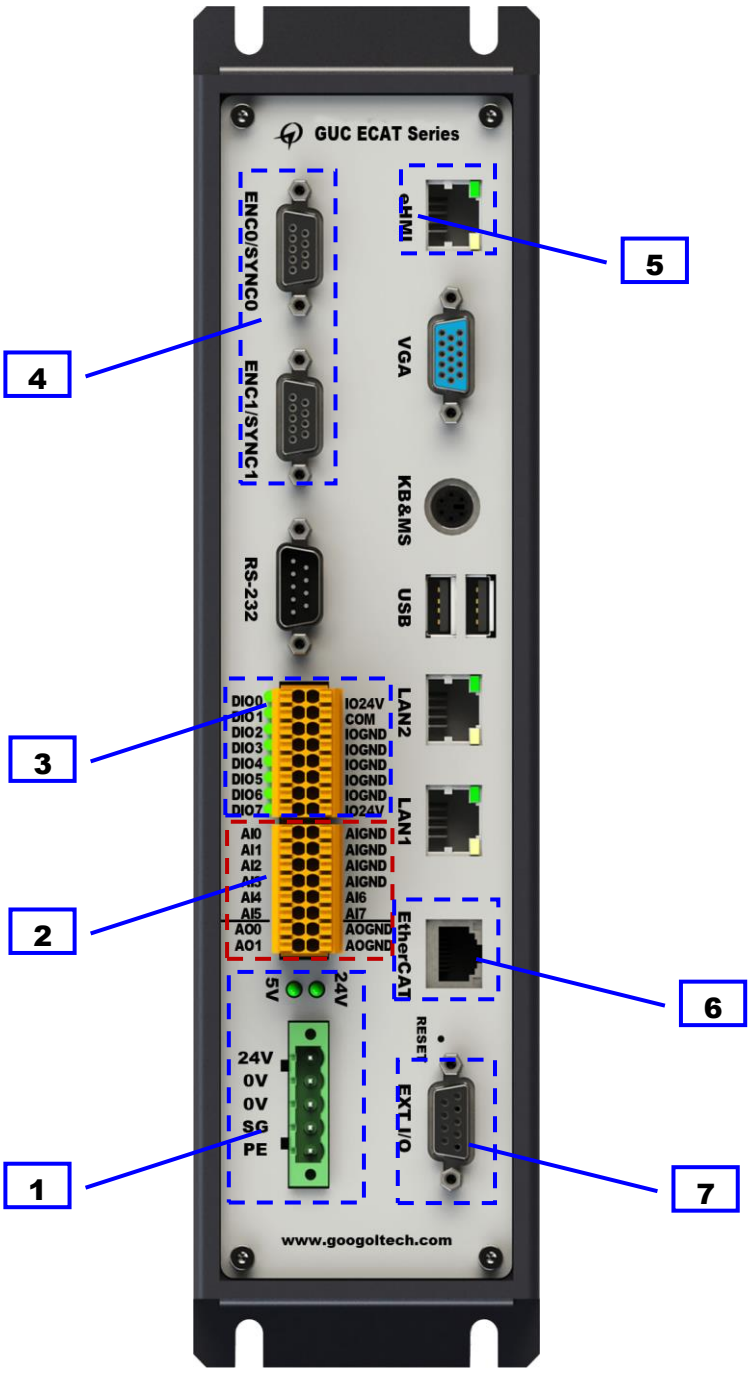

Fig 3-1 Interface of GUC-ECATcontroller

Tab 3-4 Definition of special interface

Label	Port	Description
1	POWER	Power.
2	AI/AO	Analog input/output.
3	DI\DO	General digital input/output.
4	ENC	Auxiliary encoder port.
5	eHMI	Kilomega network display port.
6	EtherCAT	Standard EtherCAT port.
7	EXTI/O	High speed IO extension port.

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(1) POWER

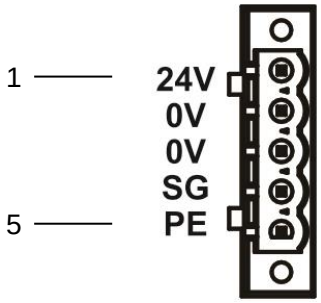

Fig 3-2 Pin description of power port

Tab 3-5 Description of power port

Pin	Port	Description
1	24V	+24V power
2	0V	+24V reference ground
3	0V	+24V reference ground
4	SG	Digital ground
5	PE	Protection earth (connect with earth)

(2) AI\AO（Analog input/output）

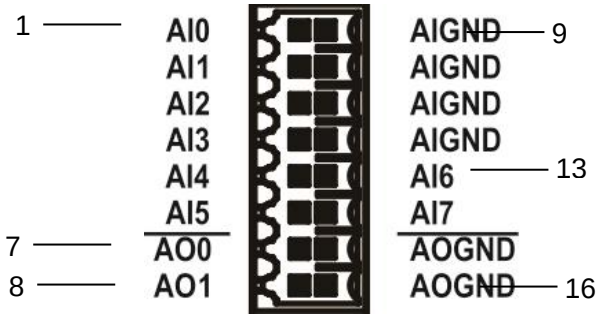

Fig 3-3 Pin description of analog input/output

As shown in Fig 3-3, there are 8 analog input channels(AI0~AI7) and 2 analog output channels(AO0~AO1).The interface design is easy to use the recommended UTP connection, which can reduce the interference. For the definitions of analog input/output port, please refer to Tab 3-6.

Tab 3-6 Definitions of analog input/output port

Pin	Signal	Description
1	AI0	Analog input 0
2	AI1	Analog input 1
3	AI2	Analog input 2
4	AI3	Analog input 3
5	AI4	Analog input 4
6	AI5	Analog input 5
13	AI6	Analog input 6
14	AI7	Analog input 7
9~12	AIGND	Analog input reference ground Note
7	AO0	Analog output 0

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Pin	Signal	Description
8	AO1	Analog output 1
15、16	AOGND	Analog output reference ground Note

Note：AIGND、AOGND are isolated from ench other and are isolated from other ground too.

1) 8 channels analog input can be used as single-ended(reference AIGND) input either as differential input(**reference AIGND the same**).When be use as differential input:
   - AI0 and AI1 as one pair of differential input;
   - AI2 and AI3 as one pair of differential input;
   - **AI4 and AI6 as one pair of differential input;**
   - **AI5 and AI7 as one pair of differential input.**
2) The analog output value of AO0,AO1 is ranging in(-10V~10V), reference to AOGND.

CAUTION	1. Analog input value ranging in(-10V~10V), please keep the value in the range, otherwise may destory the chip of the board. 2. The load impedance of analog output must be greater than 1000 ohm, otherwise may lead to abnormal working. 3. The differenctial input must reference to AIGND. 4. User must confirm the correct corresponding channel.

CAUTION	The SG(GND), 0V, IOGND, PE, AIGND, AOGND of above interface is isolated from each other completely.Users can connect externally according to the actual nedds.

(3) DI\DO（General digital input/output）

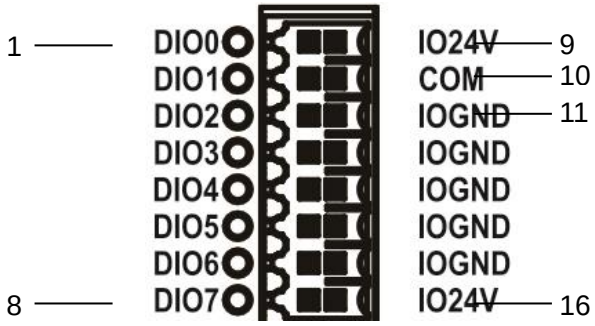

Fig 3-4 Pin description of general digital input/output

As shown in Fig 3-4, there are 8 channels general digital input/output interfaces in GUC front panel.The definition is shown in Tab 3-7 and the Internal circle in Fig 3-5.

Tab 3-7 Definitions of general digital input/output port

Pin	Signal	Description
1	DIO0	General digital input/output
2	DIO1	General digital input/output
3	DIO2	General digital input/output
4	DIO3	General digital input/output

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Pin	Signal	Description
5	DIO4	General digital input/output
6	DIO5	General digital input/output
7	DIO6	General digital input/output
8	DIO7	General digital input/output
9、16	IO24V	24V IO power Note1
10	COM	High/low active option Note2
11~15	IOGND	24V IO reference ground.

Note 1: IO24V which is 24V power supply of IO module and is completely isolated with 24V power interface needs external power supply, such as 24V power interface, but it is recommended to use the power module different from 24V power interface in order to reduce interference.

Note 2: connect COM and 24V in short circuit at the terminal through short and thick wire to set the universal digital IO input as low level (drain input); connect COM and 0V in short circuit at the terminal through short and thick wire to set the universal digital IO input as high level (source input)

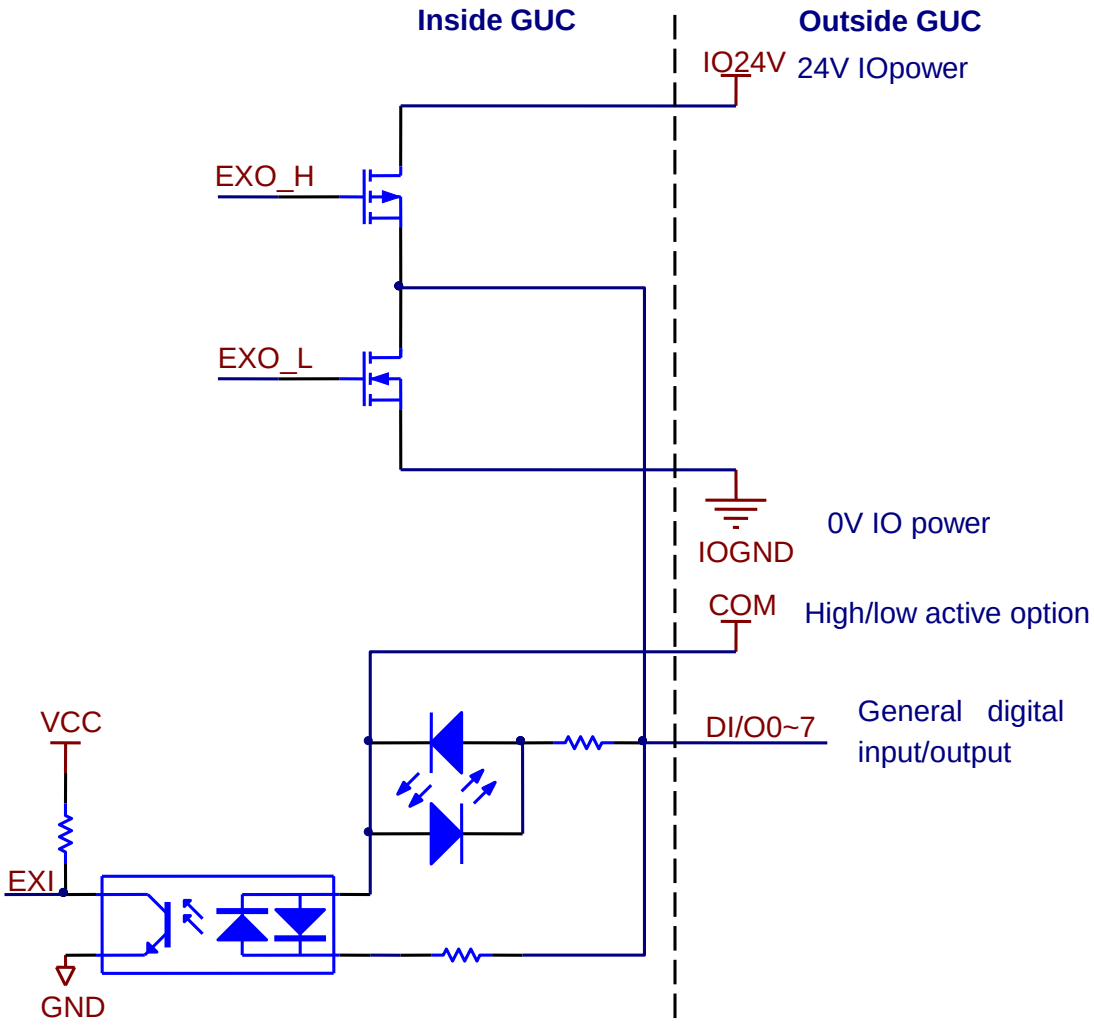

Fig 3-5 Internal circle of digital input/output

As the universal output, DI-DO terminal is set as source output or drain output through software. In case of source output (the high level output state, namely 24V and high resistance, is effective), EXO_L

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closes the down tube and EXO_H controls the effectiveness of the output. In case of drain output (the low level output state, namely 0V and high resistance, is effective), EXO_H closes the upper tube and EXO_L controls the effectiveness of the output.

As the universal digital input, EXO_L and EXO_H close the upper and down tubes at the same time, and the output is high resistance state (or else the result of the universal digital input is the value of the universal digital output) and meanwhile COM terminal is used to select the setting as drain input or source input. At this moment, DI-DO terminal is the input terminal, but as the universal digital input, the external COM terminal must be connected to 24V terminal according to the drain input or connected to 0V terminal according to the source input. If COM terminal is connected to 24V terminal (drain input), the optocoupler is switched on and EXI is effective when the external input is 0V; if COM terminal is connected to 0V (source input), the optocoupler is switched on and EXI is effective when the external input is 24V.

LED indicator light is theoretically similar to optocoupler LED of universal digital input, and COM terminal is connected to 24V terminal according to the drain input or connected to 0V terminal according to the source input, thus not only functioning as the indicator light of the universal digital output, but also functioning as the indicator light of the universal digital input.

1. If general digital output is connected with an inductive load, the effect on digital output should be considered. Make sure the inductive load won't release energy through digital output;
2. If capacitive load is larger than 1uF, to avoid false self-protection of output component, it is suggested to add a current-limiting resistance;
3. Although the eight universal digital inputs/outputs could be freely configured, it is still necessary to ensure that the drain input or source input set and selected through COM terminal must be consistent with the drain output or source output set by software, the drain type and the source type shall not be mixed for use (only the following combinations are available: drain input + drain output, or source input + source output) in order to ensure the normal operation..
4. Because there is no filter circuit more than KHz in digital input interface, it is suggested to apply software filter; if user still unsure about this, please contact with Googol Technology;
5. IO24V which is 24V power supply of IO module and is completely isolated with 24V power interface needs external power supply, such as 24V power interface, but it is recommended to use the power module different from 24V power interface in order to reduce interference.

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(4) ENC（Auxiliary encoder input signals interface）

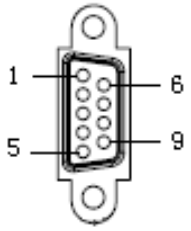

Fig 3-6 Pins description of ENC0/SYNC0、ENC1/SYNC1

ENC0/SYNC0 and ENC1/SYNC1 are auxiliary encoder input ports.The auxiliary encoder input ports could receive Phase A, Phase B and C (INDEX) signals. For the 9pin definition of ENC0/SYNC0 and ENC1/SYNC1, please refer to Tab 3-8 and for the internal circuit please refer to Fig 3-7.

Tab 3-8 Pin definition of ENC0/SYNC0 and ENC1/SYNC1

Pin	Signal	Description	Pin	Signal	Description
1	A+	Phase A+ signal of auxiliary encoder	6	A-	Phase A- signal of auxiliary encoder
2	B+	Phase B+ signal of auxiliary encode	7	B-	Phase B- signal of auxiliary encoder
3	C+	Index+ signal of auxiliary encoder	8	C-	Index- signal of auxiliary encoder
4	Reserve	reserved	9	GND	Digital ground Note
5	+5V	Power			

Note：Digital ground and SG are the same one

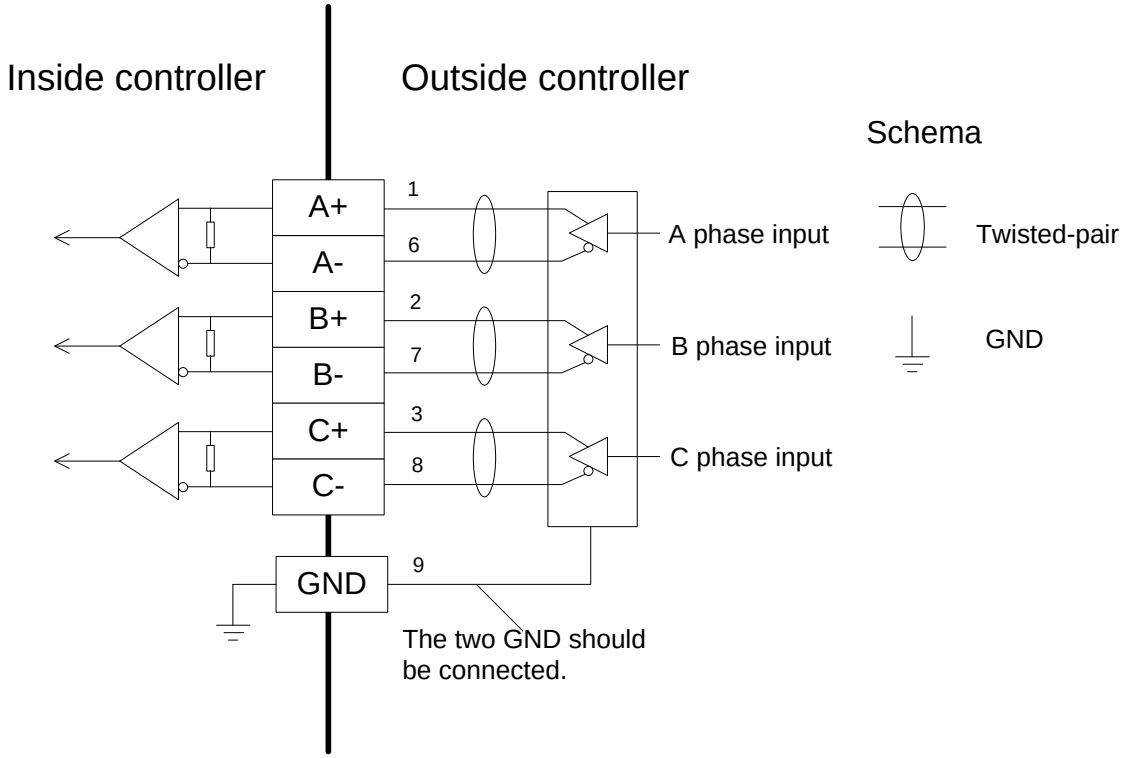

Fig 3-7 Internal circuit of auxiliary encoder ports (ENC0/SYNC0,ENC1/SYNC1)

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CAUTION	ENC0/SYNC0, ENC1/SYNC1 are differential interface, it is suggested wiring with differential mode, and the two GND should be connected. If user wants to use single-ended wiring, please contact with Googol Technology.

(5) eHMI（Kilomega network display port）

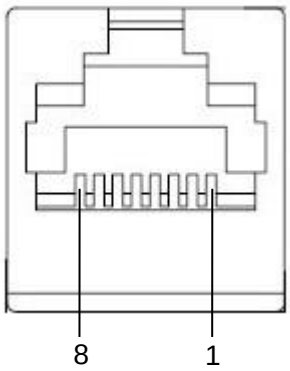

Fig 3-8 eHMI interface figure

Fig 3-8 shows eHIM interface on mainboard, Tab 3-9 give definitions of its pins.

Tab 3-9 Pin definition of eHMI port

Pin	Signal	Description	Pin	Signal	Description
1	TX0+	Transmit signal 0+	5	TX2-	Transmit signal 2-
2	TX0-	Transmit signal 0-	6	TX1-	Transmit signal 1-
3	TX1+	Transmit signal 1+	7	TX3+	Transmit signal 3+
4	TX2+	Transmit signal 2+	8	TX3-	Transmit signal 3-

(6) EtherCAT(Standard EtherCAT port)

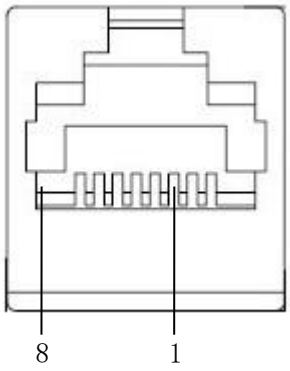

Fig 3-9 EtherCAT interface figure

Fig 3-9 shows eHIM interface on mainboard. For the interface definition, please referece EtherCAT standard.

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(7) EXTI/O（High speed IO extension port）

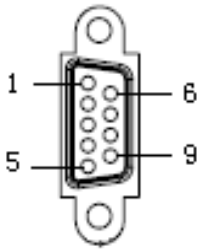

Fig 3-10 EXT I/O interface figure

Fig 3-10 shows expanded IO interface on mainboard, Tab 3-10 gives definitions of its pins.

Tab 3-10 Pin definition of EXT I/O port

Pin	Signal	Description	Pin	Signal	Description
1	GND	Digital ground Note	6	NC	NC
2	HSIO_TX＋	Extended IO transmit+	7	HSIO_TX－	Extended IO transmit-
3	HSIO_RX＋	Extended IO receive+	8	HSIO_RX－	Extended IO receive-
4	NC	NC	9	NC	NC
5	NC	NC			

Note：Digital ground and SG are the same one.

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Chapter 4 Test and Tune

4.1 Introduction

ECatDemo which is the function demonstration software of Googoltech motion controller GUC-ECAT compiled on the basis of CPAC could be used to check and monitor the state of the controller and test different function modules of the controller.

Double click “GRT” in CPAC file to automatically run the software, with the software interface shown in Fig 4-1 and Fig 4-2, click “Next” to switch to interface 2 and click “Back” to switch to interface 1. ECatDemo checks the return value of each run control instruction and display error in “Instruc Return”.

Attention: for writing new program to CPAC, please firstly back up original CPAC file folder, wherein decimal system is adopted for all inputs and outputs in ECatDemo.

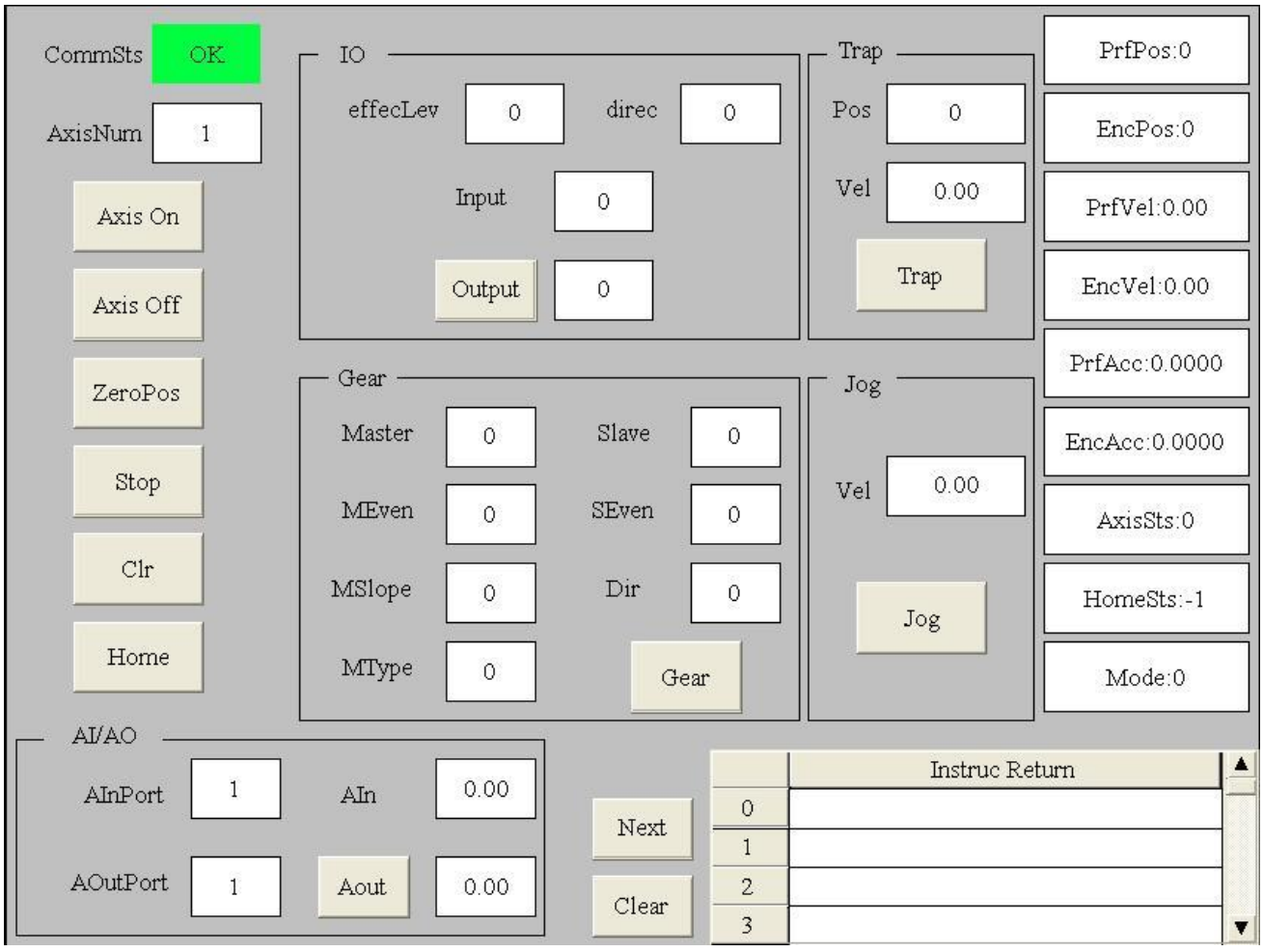

Fig 4-1 ECatDemo panel1

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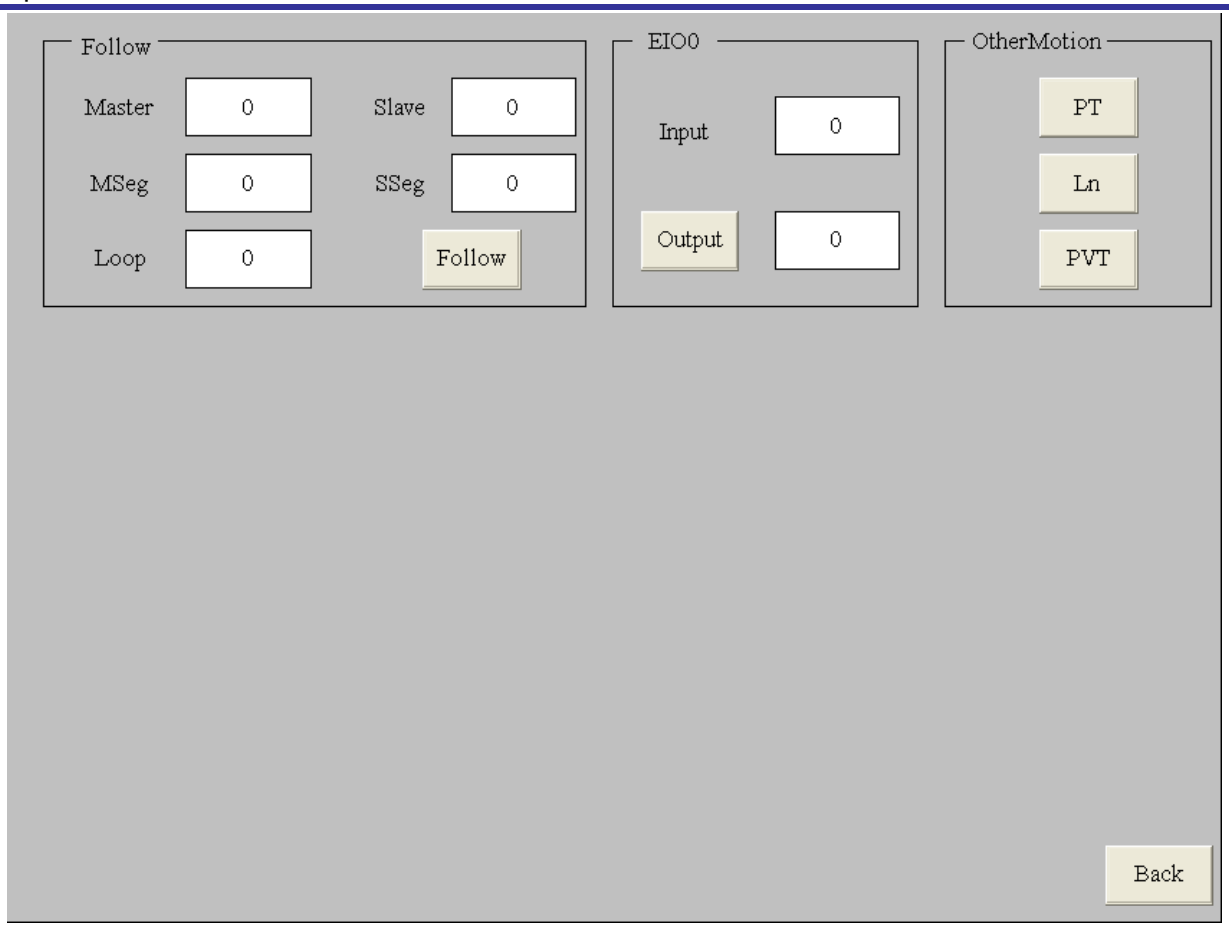

Fig 4-2 ECatDemo panel 2

4.2 Quick use

4.2.1 Ensure the communication between controller and slave

In order to establish the communication with the substation, the controller must ensure that the quantity of hung substations must be more than or equal to the quantity of substations configured for the controller. The method of configuring substations for the controller is as follows: modify file “Gecat”->“[SlaveIndex]”->“Value”; please refer to Fig 4-3 for details.

```
[MasterInfo]
Param0=name=nindex,Section=DWORD,Value=0
Param1=name=dlevel,Section=DWORD,Value=0
Param2=name=iofreq,Section=DWORD,Value=1

[SlaveIndex]
Param0=name=slavenum,Section=DWORD,Value=6

[SlaveStart]
Param0=name=position,Section=DWORD,Value=0
Param1=name=active,Section=DWORD,Value=0
Param2=name=slaveflag,Section=DWORD,Value=0
```

Fig 4-3 Method of Configuring Substations for Controller

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After modifying the above configuration, run “GRT”: if the controller successfully establishes the communication with the substation, “CommSts” in Fig 4-1 will display “OK”; if the controller fails to establish communication with the substation, “CommSts” in Fig 4-1 will display “FAIL”. In case of communication failure after configuration modification, please restart GUC-ECAT controller and substation. Once the controller establishes communication with the driver, various functions of the controller could be used.

4.2.2 Homing and limit

GUC-ECAT controller takes Input7 of servo drivers as the positive limit switch and Input 9 as the negative limit switch and the use method of the limit switch is in accordance with traditional GTS. Input7 and Input9 could be configured or not configured as the positive and negative limit switches of the driver.

GUC-ECAT adopts the zero return mode built in the driver. For the specific definition of the zero return mode, please refer to ***User’s Guide of GTHD EtherCAT Servo Driver***. ECatDemo adopts method 3 to conduct zero return and needs to configure one IO as origin switch, which shall not be conflicted with the limit, and the specific operation is as follows:

1) Click “AxisOff” in Fig 4-4, click “Home” and then switch to zero return mode to start zero return;

2) “HomeSts” will be changed from “-1” to “0” to trigger the origin switch. When “HomeSts” is changed as “3”, zero return is ended; then the position control mode is automatically switched and accordingly the position control could be conducted.

In case of mode switch, the driver must be under servo state, and GUC-ECAT temporarily only supports zero return mode and position control mode.

- ✓ When “HomeSts” is “0”, it indicates that the zero return is being conducted;
- ✓ When “HomeSts” is “0”, it indicates that zero return is interrupted or not started;
- ✓ When “HomeSts” is “2”, it indicates that zero return signal has been triggered, but the target position is not available;
- ✓ When “HomeSts” is “3”, it indicates that zero return is successful.

For the meanings of other values, please refer to driver user manual.

During zero return process, the user could click “Stop” to suspend zero return and click “Home” to continue zero return, but the trigger limit signal could not stop zero return, except that Input7 and Input9 are configured as the positive and negative limit signals of the driver. In ECatDemo, once zero return is started, the position control mode could not be switched except zero return completion (“HomeSts”=3).

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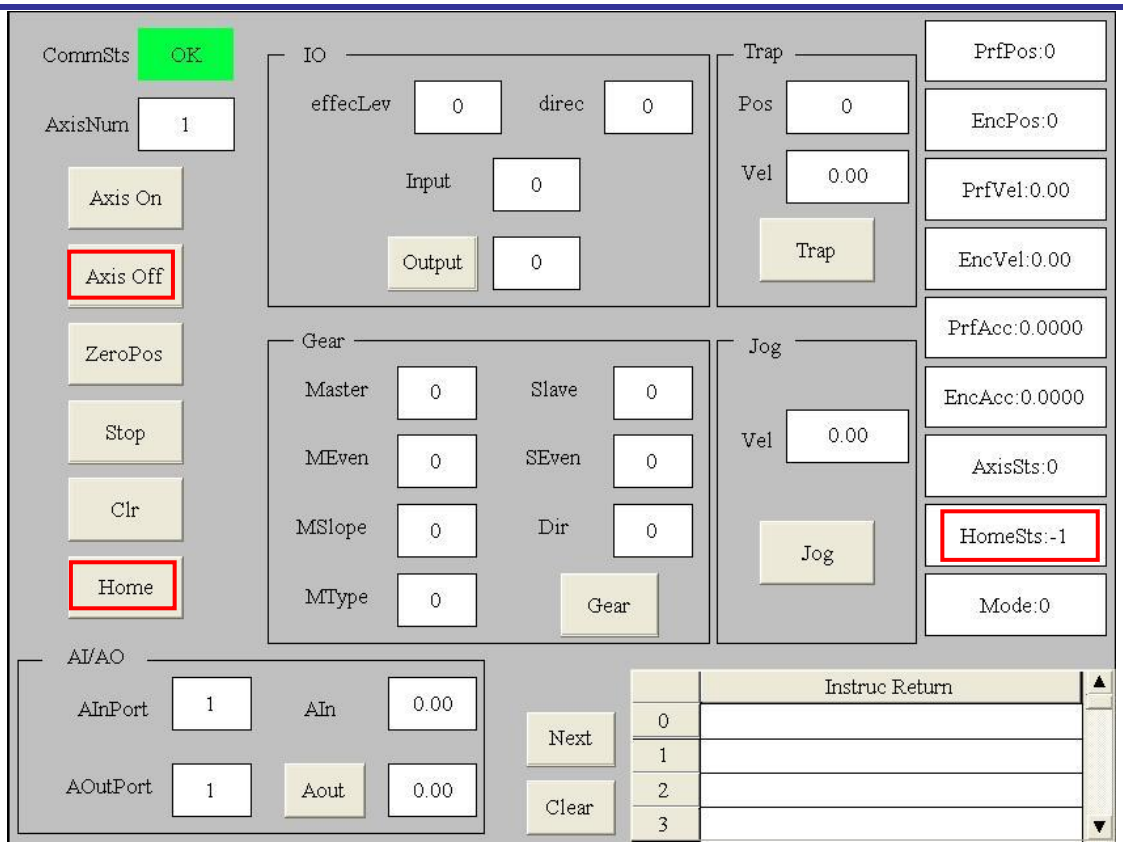

Fig 4-4 Homing panel

4.2.3 Local IO

GUC-ECAT provides 8- channels IO, which could be configured as input, output, or one part as input and the other part as output, as shown in Fig 4-1:

1) “IO”->“direc” set DI or DO by bit, wherein 1 stands for taking this bit as DI and 0 stands for taking this bit as DO.

2) “IO”->“effecLev”: set effective level for IO, wherein 0 stands for effective low level and 1 stands for effective high level. Meanwhile, the hardware wiring shall match with such configuration. For the details, please refer to Chapter 3.

3) “IO”->“Input” : read input IO; “IO”->“Output”: set output IO.

4.2.4 Analog input and output

For the details of analog input and output function provided by GUC-ECAT, please refer to Chapter 3. In Fig 4-1, “AI/AO”->“AInPort”: set analog input port; “AI/AO”-> “AOutPort”: set analog output port; “AI/AO”->“AIn”: read analog input; “AIn” ->“AOut”: set analog output.

4.2.5 Auxiliary encode

GUC-ECAT provides 2-channels auxiliary encoder, and after “AxisNum” in Fig 4-1 is set as 9 or 10, the

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input value of the auxiliary encoder could be read in “EncPos”.

4.2.6 Motion mode

GUC-ECAT supports Point to Point motion mode, Jog motion mode, PT motion mode, Gear motion mode, Follow motion mode, interpolation motion mode and PVT motion mode. EcatDemo provides the demonstration function for the above motion modes, but it is necessary to ensure the right state of “AxisSts” in Fig 4-1 before motion. “Trap”, “Jog” and “Gear” have complete parameter settings, and please refer to Programming Manual for the specific settings. In “Follow” motion mode, master shaft (“Master”), slave shaft (“Slave”), main shaft segment (“MSeg”) and slave shaft segment (“SSeg”), loop times (“Loop”) could be set, and other parameters are constant values. In “PT” and “PVT” motion modes, “Ln” is unavailable for parameter setting and is a preset value, and “Ln” is set as axis 4 shaft linear interpolation. In “Trap”, “Jog”, “PT” and “PVT” motion modes, the present value of “AxisNum” is taken as the motion shaft.

4.2.7 Extended module

Connect one DI16xDO16 digital quantity module to GUC-ECAT and set the address as 0. In Fig 4-2, “EIO0”->“Output”: set the output under through EcatDemo; “EIO0”->“Input”: read the input through EcatDemo

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Chapter 5 Examples of Common Peripherals Connection

5.1 Inverter

Peripheral: Siemens MICROMASTER 410 inverter.

(1) Wiring of analog control:

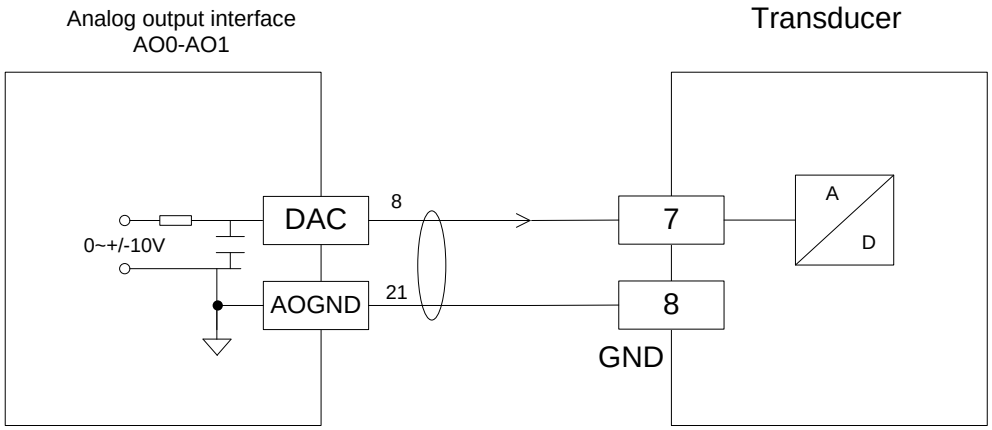

Fig 5-1 Wiring of analog controlling inverter

(2) Wiring of digital control:

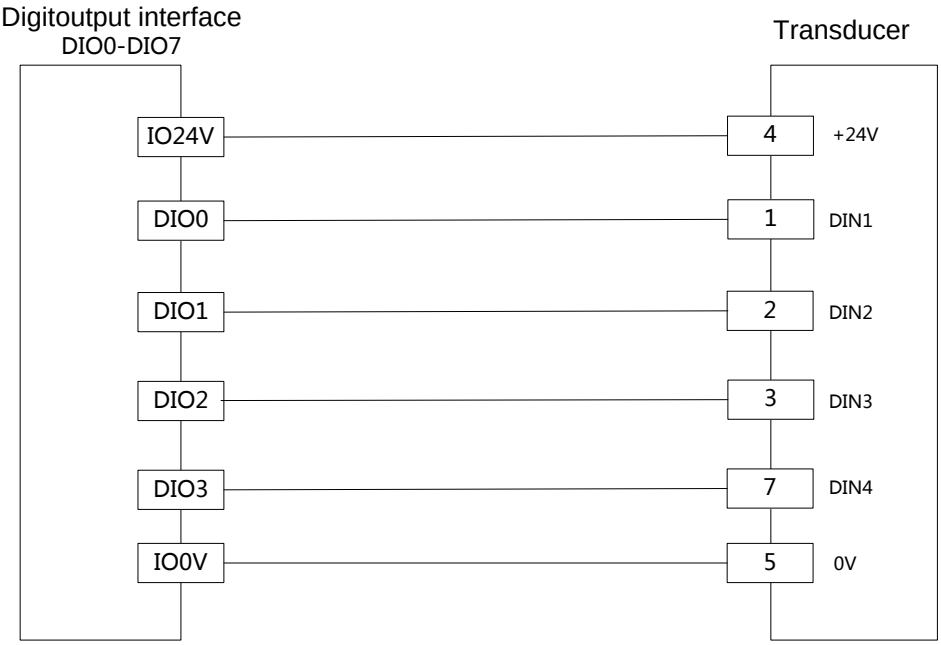

Fig 5-2 Wiring of analog controlling inverter

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Note: GUC-EtherCATcan achieve sink output and sourcing output, please refer to 3.2 for detail.

CAUTION	It is strongly suggested, pay attention to energy release when general output IO controls an inductive load, please refer to Fig 5-3.

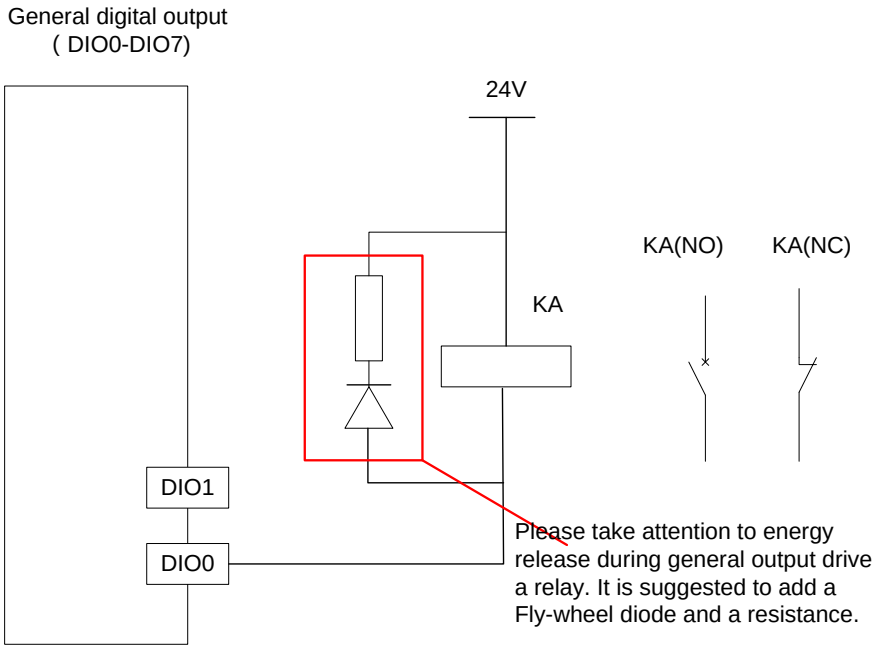

Fig 5-3 General output connect a relay

5.2 Rotary encoder

Peripheral: Heidenhan rotary encoder

- Power supply: 5V
- Signal mode: Incremental TTL

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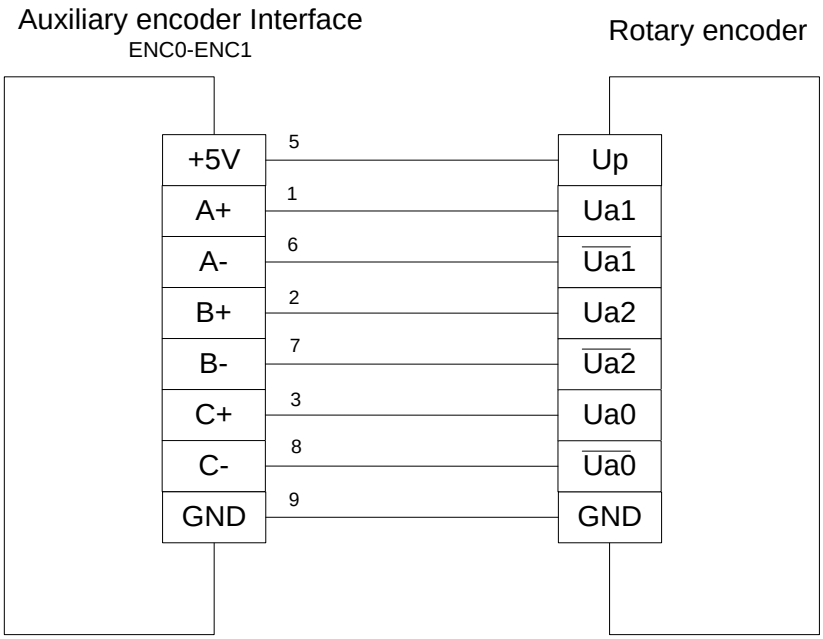

Fig 5-4 Wiring of Heidenhan rotary encoder

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Chapter 6 Appendix

6.1 Technical Specification

6.1.1 Overview

1. System control/ refresh cycle, please refer to GTS parameters.

Tab 6-1 Control cycle

NO.	item	GTS
1	Interpolation cycle	250us
2	PID control cycle	125us
3	Encoder feedback sampling cycle	125us
4	Analog output refresh cycle	125us

2. Power supply

Tab 6-2 GUC-EtherCAT controller power supply

NO.	item	Terminal board
1	power supply voltage (error band)	24±10%(V)(Note 1)
2	start-up current	2A
3	Working current	2A

Note1: As shown in Fig 6-1, GUC-EtherCAT controller is supplied by a 24V switching power, the general IO interface also supplies 24V power for external IO load, the current list in Tab 6-2, only include controller working current, but do not include general IO load current, when choose switching power, user has to calculate sum of controller working current and external load current.

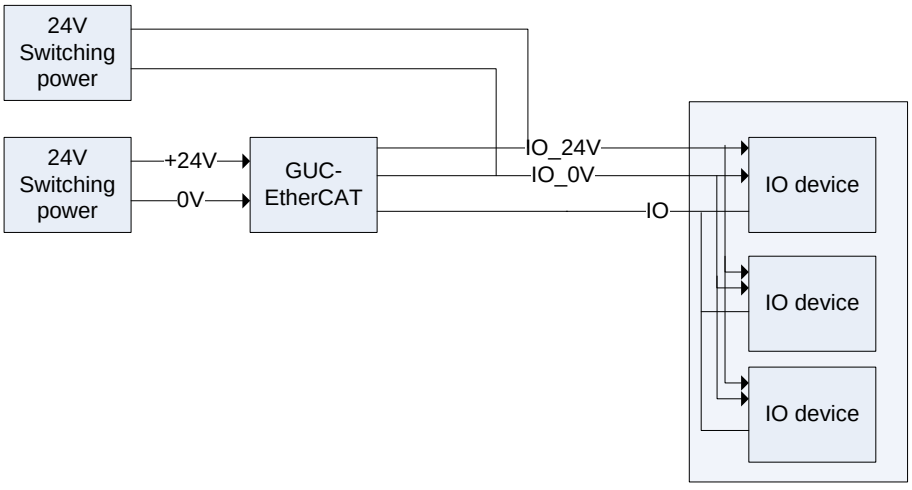

Fig 6-1 Schematic diagram of GUC-EtherCAT controller power supply

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6.1.2 Control interface parameters

1. Description of driver control interface

   The interface of GUC-EtherCAT driver control is EtherCAT fieldbus, detailed specifications please refer to the relevant information.

2. Electric parameters for pulse output signal (consistent with RS-422 standard)

Tab 6-3 Electric parameters for pulse output signal

Item	Sign	Nominal value AM26LS31
differential output voltage	V_{OD}	Min=2.0V typ=2.6V
Logic “1” voltage output	V_{OH}	Min=2.5V typ=3.0V
Logic “0” voltage output	V_{OL}	Max=0.4V typ=0.2V
Maximum Frequency of output pulse	F_P	1MHz （Note 1）

Note1: Frequency of single output pulse.

Note2: There is no specified functions of pulse output interface yet. if there is demand for the specific features, please contact with Googol Technology.

3. Encoder overview

Tab 6-4 Encoder overview

Item	Description
Type	Incremental encoder(whether support absolute encoder ,please contact sales engineer)
Wave form request	square wave (whether support sine and cosine wave , please query sales engineer)
Single-ended/differential	It is strongly suggested to use differential encoder (whether support single-ended, please contact sales engineer)
power supply	Supply 5V voltage output to encoder(7th pin) Maximum current for one encoder: 200mA

4. Electric standard for encoder input signal

Tab 6-5 Electric parameters of encoder input signal

Item	Sign	Nominal value（AM26LS32）
Maximum Frequency of input pulse	F_P	2MHz （Note）
Logic “1” differential voltage input	V_{IT+} (VID+)	>0.2V

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Item	Sign	Nominal value（AM26LS32）
Logic “0” differential voltage input	V_{IT-} (VID-)	<-0.2V
Range of common mode voltage of differential signal	VIC	-7V~+7V

Note: frequency of A phase and B phase quadrature encoder pulses before quadrupled.

5. Electric standard of analog output signal

Tab 6-6 Electric parameters of analog output signal

Item	Sign	Nominal value
Voltage output type	SE(single-ended output) DIFF(differential output)	Single-ended output
Voltage output range	V_O	-10V~+10V
Output current range	I_O	<±10mA
Required load	R_L	>1kOhm
Resolution	RES	12 bit（Note）
Zero error	Zero Offset	±6mV
Refresh cycle	GUC-ECAT	125 us

Note: Analog output is designed for 12bit accuracy currently, for more precision, please contact with Googol Technology.

6. Electric standard of analog input signal

Tab 6-7 Electric parameters of analog input signal

Item	Sign	Nominal value
Voltage input type	SE(single-ended input) DIFF(differential input)	Single-ended input
Input voltage range	V_I	-12.5V~+12.5V
input impedance	R_I	Typ=10kOhm
Resolution	RES	12bit
Zero error	Zero Offset	Min=-30mV,typ=±8mV,max=36mV
Sampling cycle	T_S	125us

7. General digit input interface, general input adopt Optical-Isolated.

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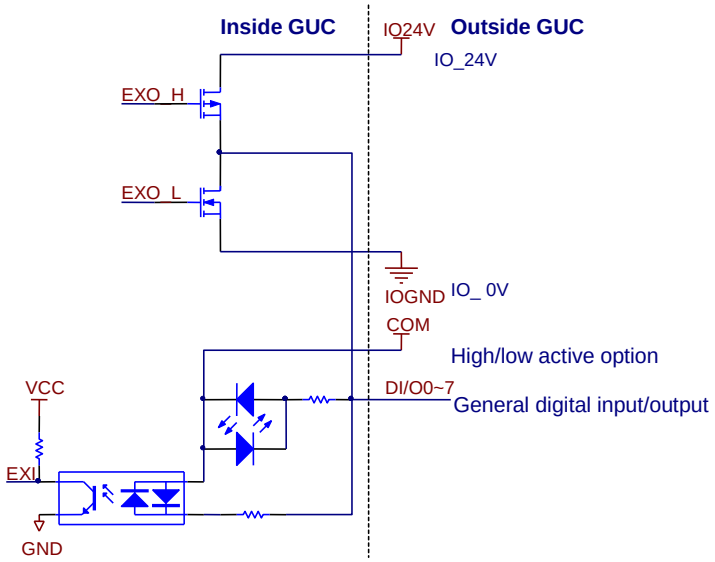
Tab 6-8 Electric parameter of general digit input

Item	Sign	Nominal value
Turn-On voltage (input valid）	V_{IH}	>15V（Explanation: 5~15V is the uncertain status, the motion controller can not distinguish its level state accurately）.
Turn-off voltage (input invalid）	V_{IL}	<5V（Explanation: 5~15V is the uncertain status, the motion controller can not distinguish its level state accurately）.
Turn-On current (input valid）	I_{IH}	>8mA
Turn-off current (input invalid）	I_{IL}	<3mA
isolation voltage	BV	3750 Vrms@AC,1min
isolation resistance	R_{I-O}	min=1E6MOhm,typ=1E8MOhm@VS=500V
maximum sampling cycle		250us
equivalent principle diagram		

Please refer to 3.2 for the details of general digital input interface.

8. General digit output interface, general output adopt Optical-Isolated

Tab 6-9 Electric parameter of general digit output

Item	Sign	Nominal value
Maximum output sink current	I_{OL}	0.5A
Maximum total output current (8 channels)	I_{MAX}	4A
Maximum leakage current when turn-off	I_L	<0.5uA@Vds=24V
Logic “0” output voltage	V_{OL}	0.36V@ ID=200mA
Isolation voltage	BV	3750 Vrms@AC,1minute
Isolation resistance	R_{I-O}	min=1E6MOhm,typ=1E8MOhm@VS=500V

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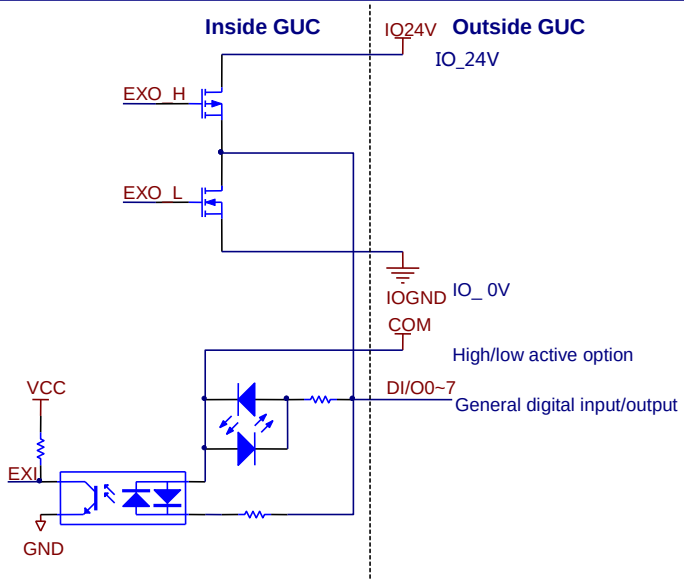
Item	Sign	Nominal value
Maximum switching frequency		10KHZ
equivalent principle diagram		

Please refer to 3.2 for the details of general digital output interface.

9. Extend IO interface.

   Dedicated interface, if needed, please contact with Googol technology.

10. Operating Temperatur: 0-55℃ （32℉-131℉）。

11. Relative Humidity: 5%-90% no dew.

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6.2 Troubleshooting

Tab 6-10 Summary of troubles

	Trouble	Cause	Handle
1	No display on VGA	Invalid setting of refresh rate. The maximum refresh rate of some LCD displays is 60HZ. Higher refresh rate may cause wrong display or no display.	Connect to CRT monitor or LCD display that support higher refresh rate, and set the refresh rate to adapt for the LCD display.
		Video driver malfunction. The system starts and displays normally before entering the OS. Wrong display arises only after entering the OS, but display normally in safe mode. This case is caused by incorrect display mode. The signal output is switched to LVDS.	1. Press Ctrl+Alt+F1 after entering XP to switch to VGA display. 2. Use the video driver provided by the product CD.
		Information of BIOS setting lost. Can't start the system, and the keyboard has no responds. This may be caused by problems of BIOS.	Power off. Insert a cuspate tool such as toothpick into the reset hole to reset system.
2	No display on LVDS	Invalid setting of refresh rate.	Connect to VGA monitor. Set appropriate resolution in BIOS (Match to the resolution of LVDS). Advanced Chipset Features—>Panel Type(LVDS)—>1024*768*18bit
3	There are snow on LVDS display	noise	Connect SG and PE with Short connector or heavy gage wire
4	USB device malfunction	Unstable connection of USB CD-ROM with lower USB port.	Use upper USB port to connect CD-ROM.

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	Trouble	Cause	Handle
		Only one can be worked correctly when using HMI and USB.	Use the upper USB port.
		Cannot detect USB mouse after the system starts.	Reinsert or change to another USB port.
5	Cannot start with the USB boot disk	Invalid BIOS setting	Set boot device to USB-HDD in BIOS
		The USB disk used cannot serve as a boot disk	Change another USB disk
6	Cannot start with the USB boot disk	mainboard chipset compatibility problems	Do not insert USB disk in the procedure of startup.
7	Communication between host and the motion controller fail	Chip on the motion controller is damaged	Replace motion controller
		Version of the motion controller is not correct	Replace motion controller or change the software of motion controller.
8	Reset TPV card, but DAC output is not 0	Initialization output warped because of work environment and system.	Adjust the zero drift parameter of driver or use motion controller to compensation the drift.
9	Encoder signals can't be read properly	Wrong wiring of encoder	Check the wiring of the encoder
		Electric noise	Shield the connection wire of the encoder. Transfer the signal with differential mode. Shorten the wire length of the encoder wire
		Too high frequency of the encoder	The frequency of the encoder signal is above 8MHz. change another encoder with lower frequency.
		Encoder does not work	Check the signals that encoder output or change motion controller
		Motion controller error	Replace the motion controller
10	The motor is fly off (for TPV card)	Encode A,B phase is in reverse	Reconnect A,B signal interface or reverse A,B phase in system configuration
11	The motor shakes (for TPV card)	The parameter of PID is set abnormality	Adjust the parameter of PID

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	Trouble	Cause	Handle
12	The motor is out of control	The effective level of the limit switch is not correct	Set the correct effective level of limit switch by corresponding command
		The axis is not enabled.	Call the command GT_AxisOn to enable the axis
		Control mode of the motion controller and the driver are not matched	Check the control mode of the motion controller and driver, and correct them.
		Motor driver alarm signal triggered	Check the reason of alarm and reset the driver. If the driver does not offer the alarm signal, user should connect pin 1 and pin 2 on port CN6 to CN13 or disable monitoring alarm signal on system configuration.
		Motor controller has abnormal work status	Check status and solve it
		Wiring of motor is wrong	Check the electric wiring of motor
		Connect to the ground incorrectly	Check the connection to the ground and correct
		The torque of the motor is too small	Check the motor driver
13	Motor position drift (for T PV card)	Motion card on open- loop status	Set as close-loop status
		Parameter PID is not set properly, usually the P is not larger enough.	Adjust PID parameter, especially the parameter P should be increased.
14	When motor driver (without servo on signal) powered on, power on host PC will cause motor to move suddenly.	Motion controller is in uncertain status at the time power on, while the motor is in working status	Before power on host PC, make sure motor driver has been powered off or disabled
15	Input or output signals of the motion controller are abnormal	Incorrect wiring	Check the electric connection
		No external power is supplied.	Check external power supply.
		Wrong connection to the ground	Reconnect the ground

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	Trouble	Cause	Handle
		The input/output interface is damaged	Replace motion controller
16	Unstable	Power consumption is low	Change power supply

6.3 Make a USB boot disk

There are many ways of make a USB boot disk, the common tools are: USBoot, Ghost and FlashBoot etc. We had introduced Ghost before, so similarly, take Ghost software to make a USB boot disk.

Make with Ghost tool, the default startup mode is USB-HDD, user should select a mode supported by the mainboard on BIOS setting. User should prepare a PC with Windows OS, a USB disk (with the experience that some USB disk can't be a boot disk, it is suggested to use Kingston USB disk), ghost software and USB boot disk image file (we use dos6222.gho in the DEMO).

Steps of make a USB boot disk are as follows:

(1) Insert USB disk, run Ghost32.exe, it will prompt dialog box as shown in Fig 6-2.

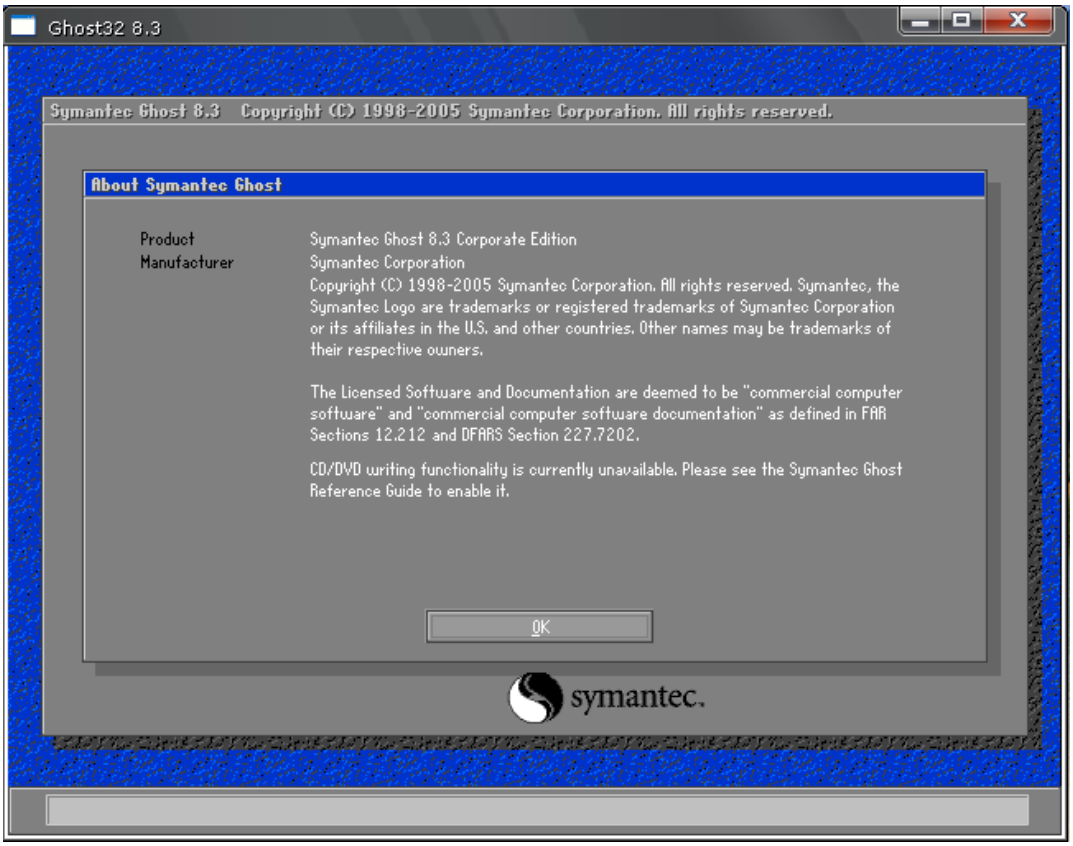
Ghost32 8.3
Symantec Ghost 8.3 Copyright (C) 1998-2005 Symantec Corporation. All rights reserved.
About Symantec Ghost
Product
Manufacturer
Symantec Ghost 8.3 Corporate Edition
Symantec Corporation
Copyright (C) 1998-2005 Symantec Corporation. All rights reserved. Symantec, the Symantec Logo are trademarks or registered trademarks of Symantec Corporation or its affiliates in the U.S. and other countries. Other names may be trademarks of their respective owners.
The Licensed Software and Documentation are deemed to be "commercial computer software" and "commercial computer software documentation" as defined in FAR Sections 12.212 and DFARS Section 227.7202.
CD/DVD writing functionality is currently unavailable. Please see the Symantec Ghost Reference Guide to enable it.
OK
symantec.

Fig 6-2 Run ghost

(2) Click "OK", it will prompt Fig 6-3, select "Local-> Disk->Form Image", there prompt a dialog box as Fig 6-4 , select dos622.gho as image file, enter.

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CAUTION

The number in dos622.gho is just a version number, not the unique file number.

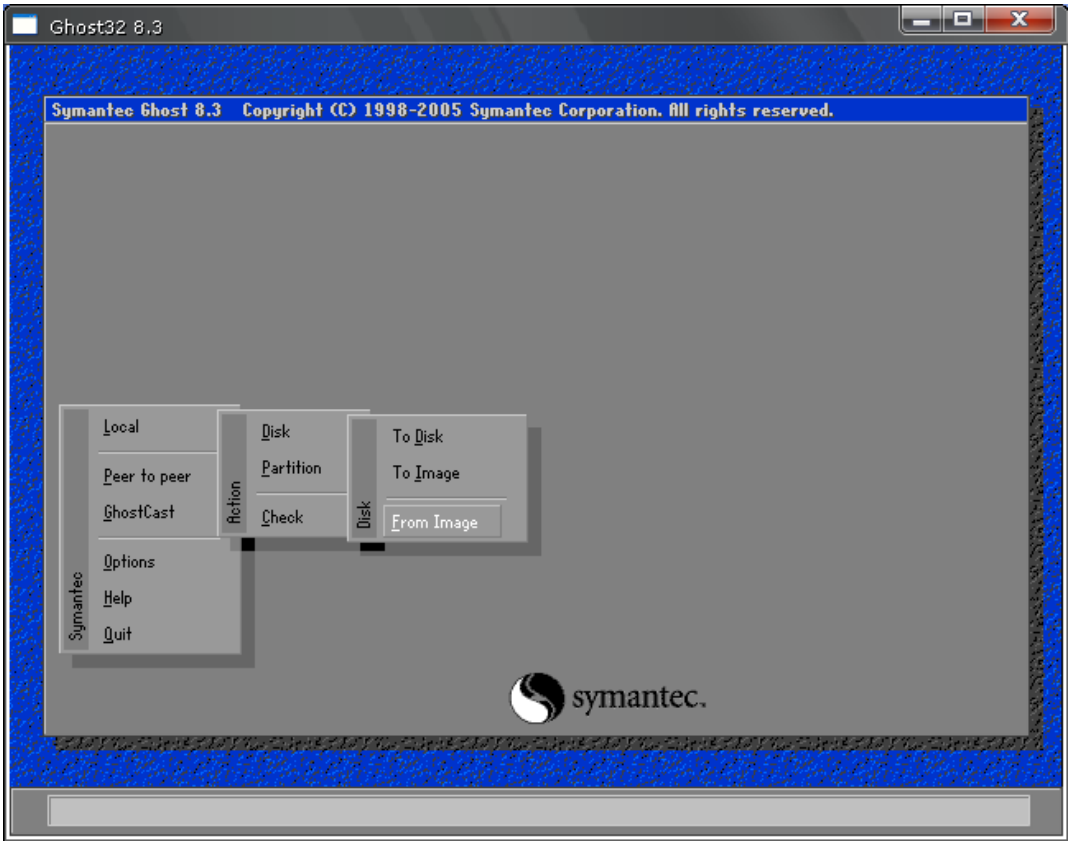

Fig 6-3 Load image file

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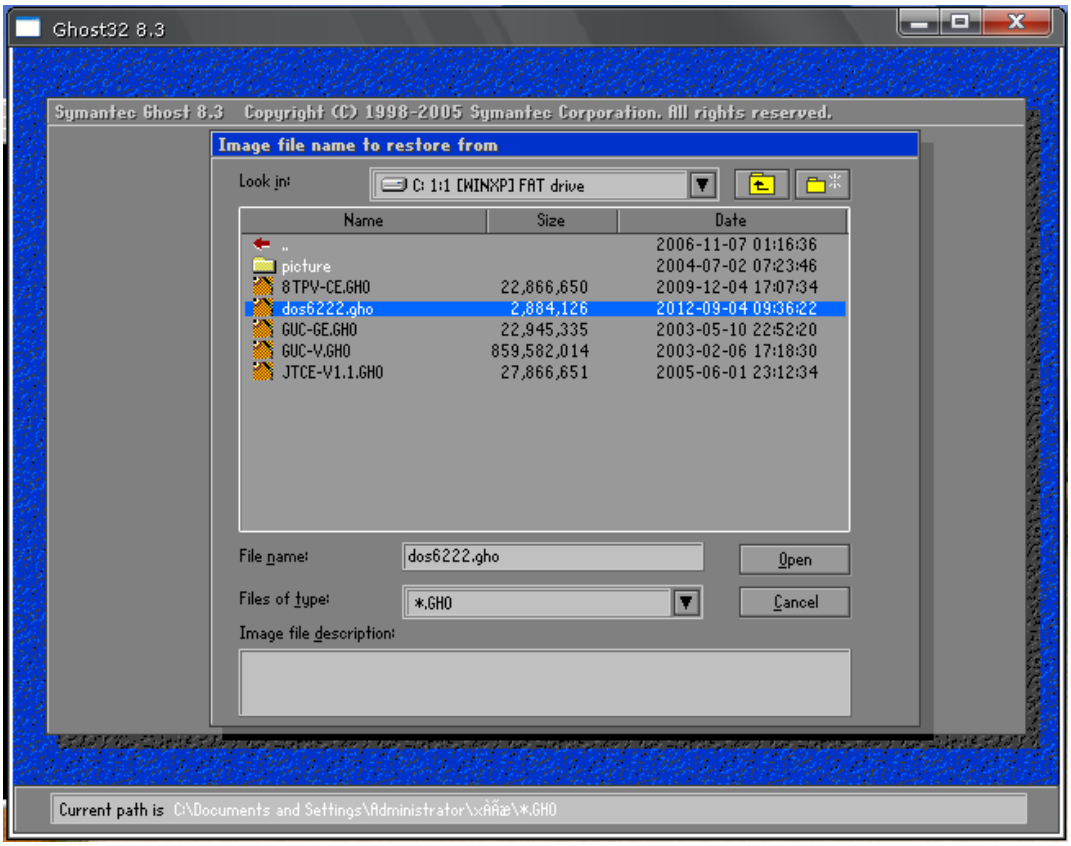

Fig 6-4 Select the USB boot disk image file

(3) Press enter after load the image file, enter interface as Fig 6-5, and select the USB disk as destination drive, press enter to destination drive details as shown in Fig 6-6.

CAUTION	USB-HDD boot mode has no limit to the size of the USB disk, the DEMO here is with 4G U disk, the user in selecting the local destination drive should clear the details of the USB disk to select a correct disk.

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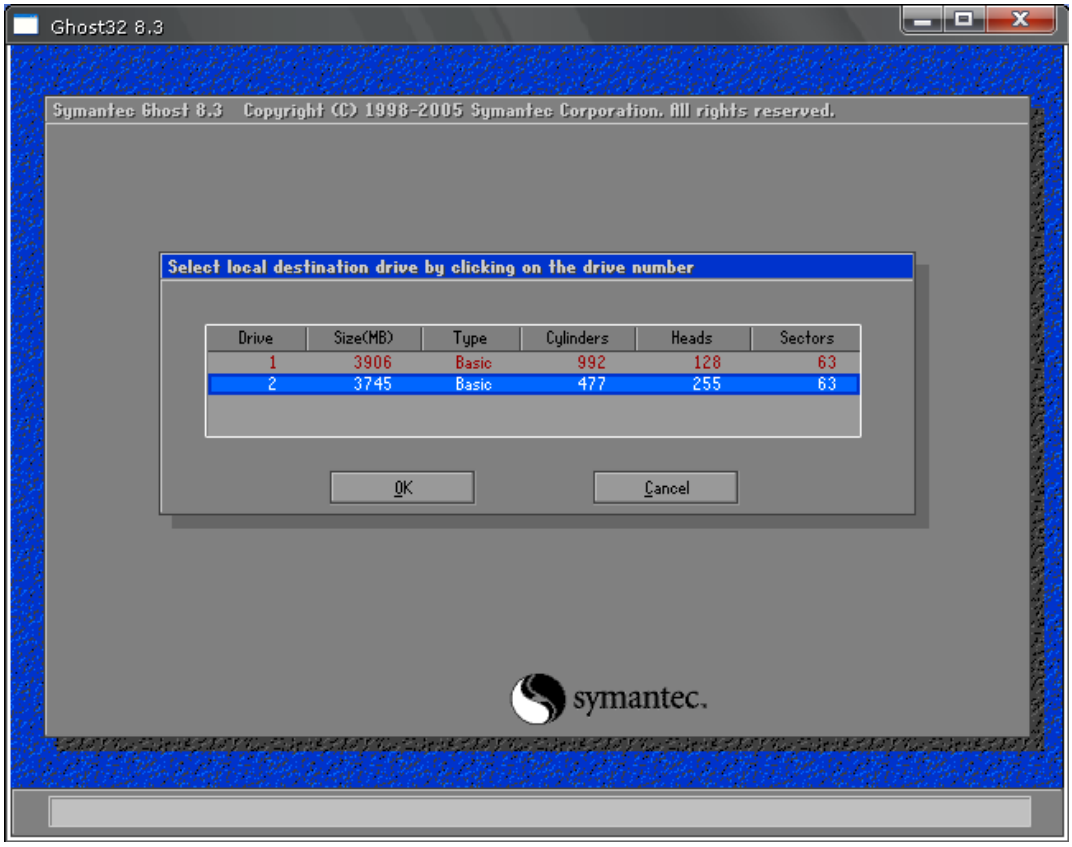

Fig 6-5 Select local destination drive

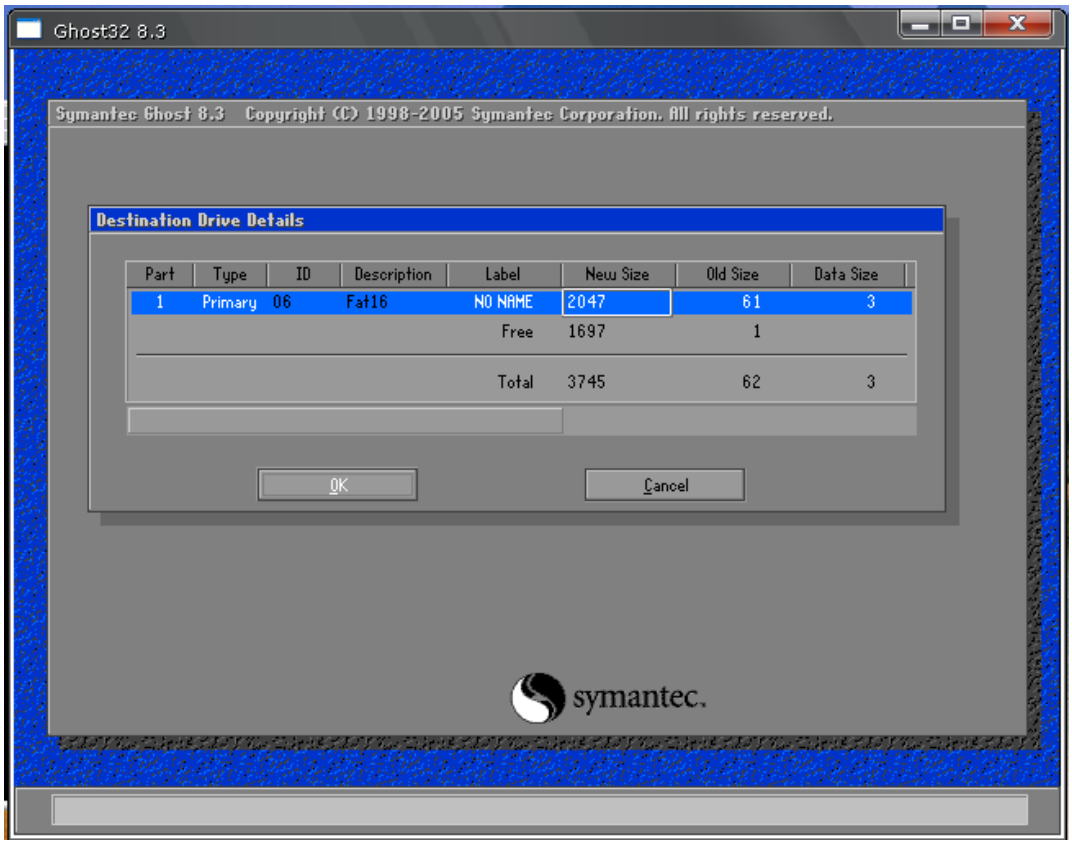

Fig 6-6 Destination drive details

(4) After the above steps, it will prompt dialog box as Fig 6-7, click “Yes” to write data in the USB

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disk. Then click “Continue” in Fig 6-8, extract USB disk, USB boot disk make completed.

CAUTION	This operation is equivalent to format the U disk, and then write data to it, users need to ensure there is no important personal data in the U disk.

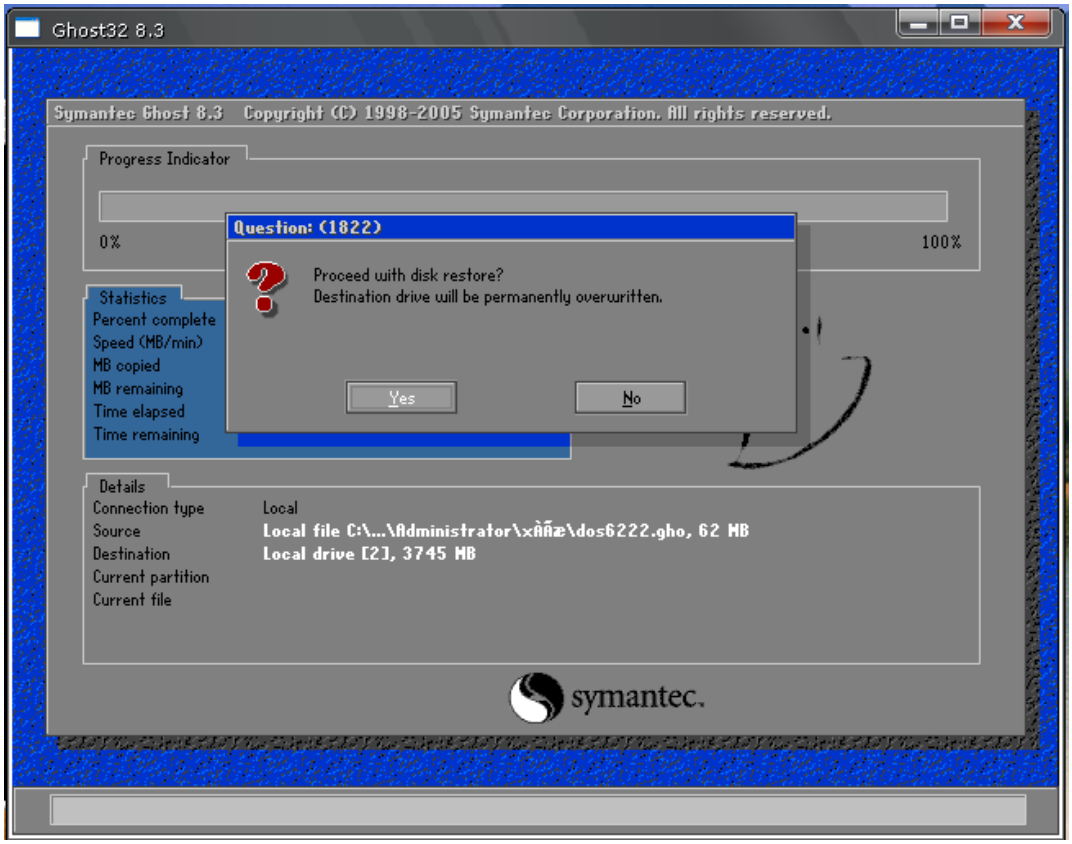

Fig 6-7 Confirm write data to USB disk

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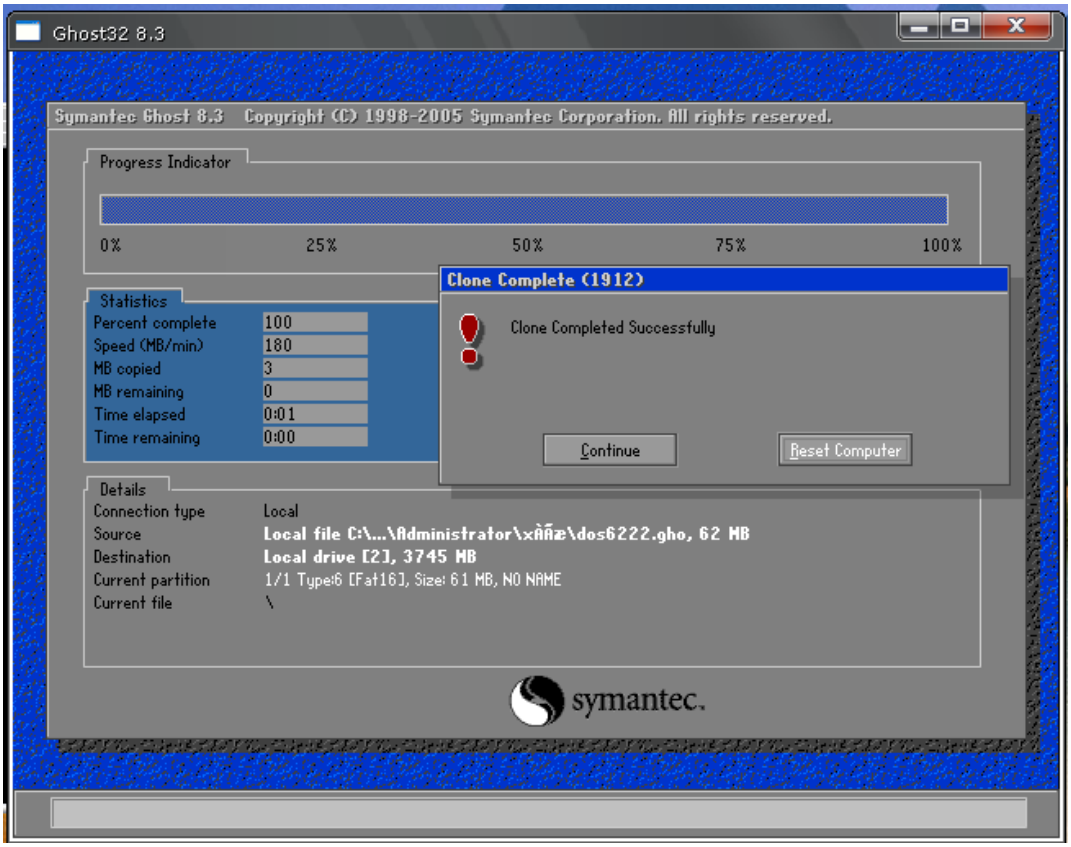

Fig 6-8 Clone completed

6.4 VC remote debug

The GUC-ECATseries motion controller resources such as CPU, memory, hard drive are designed according to the requirements of industry, in Windows XP environment, install VC + + 6.0 or Visual Studio 2005 programming tools for developing and debugging is inconvenient. Therefore, we recommend user use VC + + 6.0 or Visual Studio 2005 to remote debug.

6.4.1 VC++6.0 remote debug

Remote debug is debugging between two machines connected through the network cable. Program running on the target machine (here we refer to GUC-ECAT series motion controller) and debugger running on the host (PC installed VC + +6.0). In general, to facilitate communication, user should copy MSVCMON.EXE、DM.DLL、TLN0T.DLL and MSDIS110.DLL file in VC6/Common/MSDEV98/Bin from the host to target machine. Run MSVCMON.exe, it will prompt dialog box as shown in Fig 6-9, click “Connect” to complete the settings of target machine.

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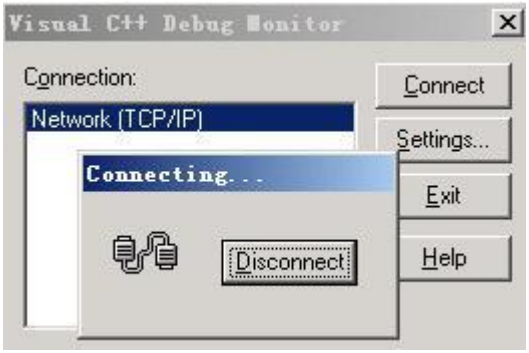

Fig 6-9 Connection setting of target machine

Next, we should set the host debugger, the first step is set remote debug switch. Start VC, select “Build->Debugger Remote Connection”, it will prompt dialog box as shown in Fig 6-10, by default, the item is “Local”, and we select “Network (TCP/IP)” instead, click “OK”. On the “Win32 Network(TCP/IP) Setting” dialog box, input Target machine name or address and click “OK” to complete connection setting.

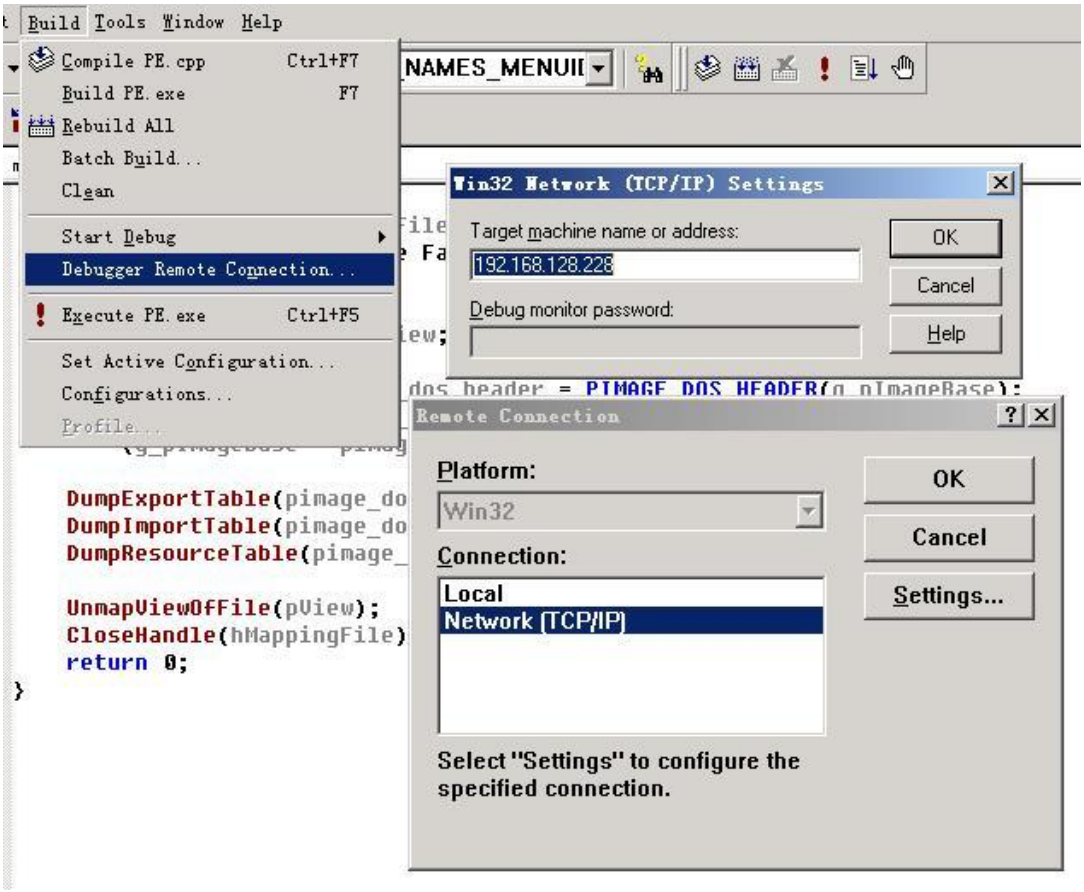

Fig 6-10 IP setting dialog box

After connection setting, open the project for test, assume the name of executable program is “RemotDebug.exe”, copy the file to target machine, assume the path is d:/Prj/RemoteDebug.exe. Switch to the host, in the Project Settings page as shown in Fig 6-11, input the path at the edit box at “Debug-Remote executable path and file name”.

After completing above steps, user can remote debug at the host machine.

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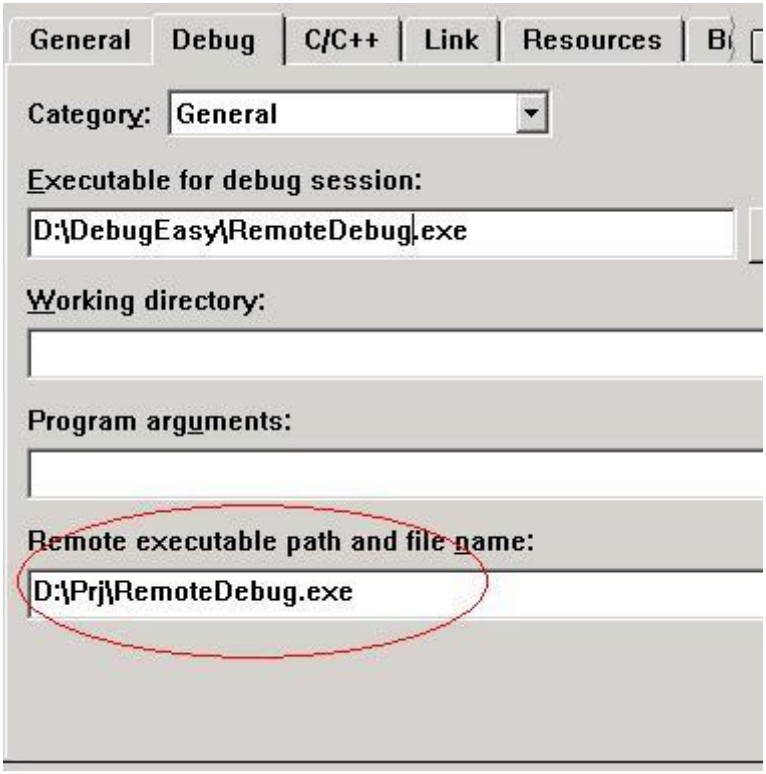

Fig 6-11 Path setting on the host

CAUTION

1. It is required that the executable program on the target machine and the host should be exactly same, user should re-copy the executable file to target machine once host compiler generate a new version of the program.
2. Be sure to input path of the target machine to see, rather than the host machine to see.
3. At the beginning, some symbol information may prompts, just click OK.
4. Remote debug settings are global, have nothing to do with the project. In fact, the above-mentioned settings of local debugger did not open any project. So, if users do not need remote debug, set “build->debugger remote connection” as “Local”. Otherwise, it will ask for remote information every time.
5. If the target machine does not install Visual Studio 6.0, debugging may occur tips “ not found MFC42D.dll ... “ , find the specified file on the development machine with the hints and copy to the target machine 'C: \ Windows \ System32' directory.

6.4.2 Visual Studio remote debug

We call the PC used for programing programs as local computer, and call GUC as remote computer.

(1) Copy the file fold in “...\Microsoft Visual Studio 8\Common7\IDE\Remote Debugger\x86” from local computer to remote computer.

(2) Connect the local computer and remote computer with a network cable, and set the IP address for the two computers to make sure they can ping each other. If fail to ping, check the IP address and close the firewall. For the local computer, IP address is192.168.0.1, subnet mask

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is 255.255.255.0, default gateway is 192.168.2.1; for the remote computer, IP address is 192.168.0.2, subnet mask is 255.255.255.0, default gateway is 192.168.2.1. The settings dialog boxes is shown as Fig 6-12, the left one is local computer, the right one is remote computer.

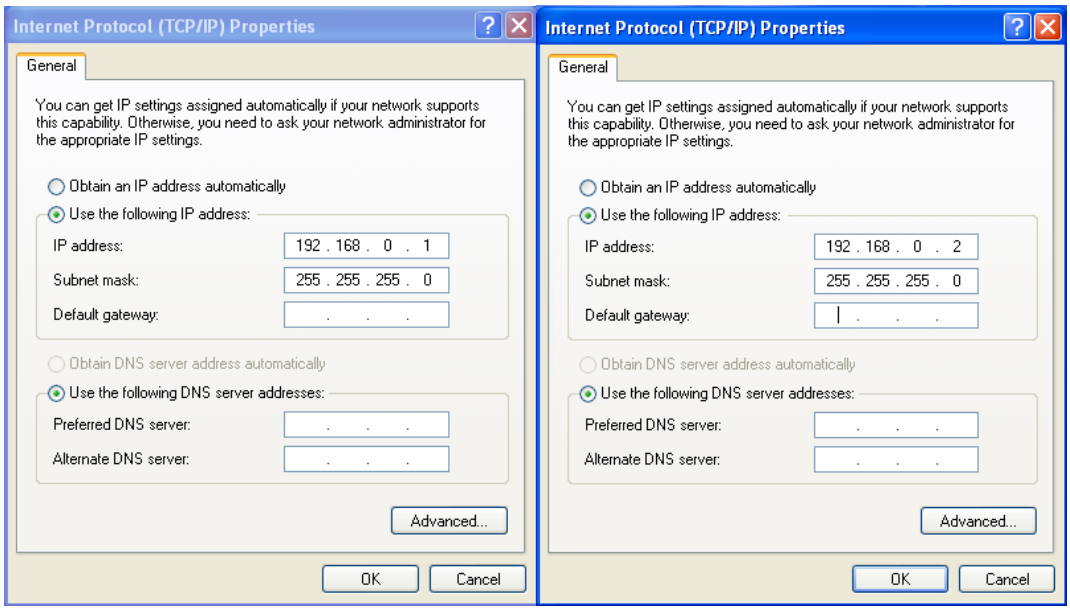
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 0 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 0 . 2
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Fig 6-12 IP settings dialog boxes

(3) Create a new shared folder on remote computer (for example: Debug), check “Allow the network computer to change my files”. Input \\192.168.0.2 at begin->run, press enter to see the folder named Debug. Setup procedure of shared fold is shown as Fig 6-13 and Fig 6-14.

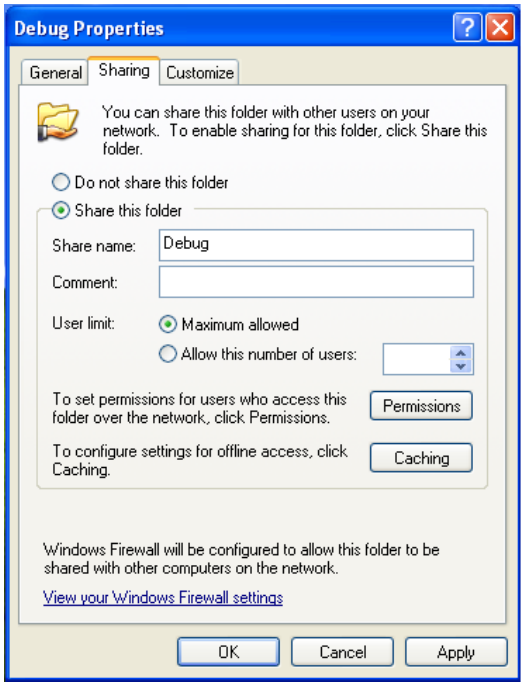
Debug Properties
General
Sharing
Customize
You can share this folder with other users on your network. To enable sharing for this folder, click Share this folder.
Do not share this folder
Share this folder
Share name: Debug
Comment:
User limit: Maximum allowed
Allow this number of users:
To set permissions for users who access this folder over the network, click Permissions.
Permissions
To configure settings for offline access, click Caching.
Caching
Windows Firewall will be configured to allow this folder to be shared with other computers on the network.
View your Windows Firewall settings
OK
Cancel
Apply

Fig 6-13 Set properties of shared folder

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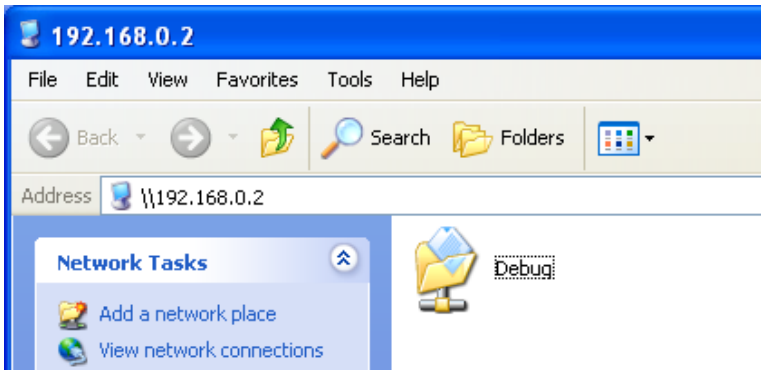

Fig 6-14 Completed sharing folder

(4) On remote computer, set “control panel->management tool->local security policy->safe options->network access-> Sharing and security model for local accounts” as Classic - local users authenticate as themselves. The process is shown as Fig 6-15.

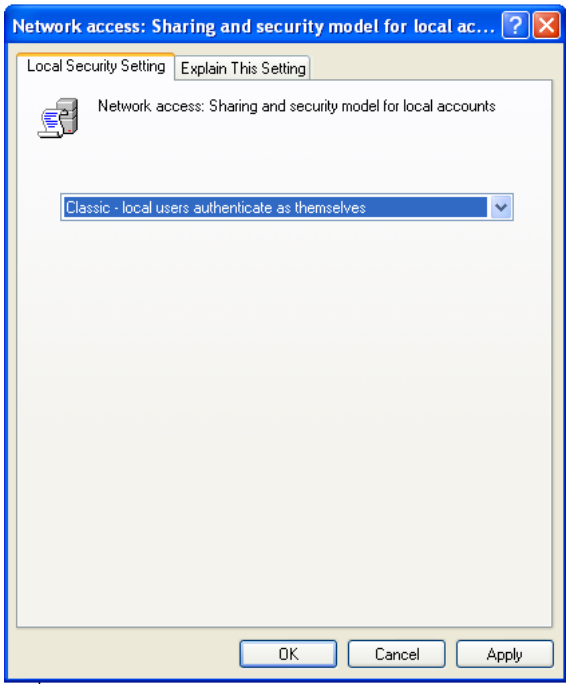
Network access: Sharing and security model for local ac...
Local Security Setting
Explain This Setting
Network access: Sharing and security model for local accounts
Classic - local users authenticate as themselves
OK
Cancel
Apply

Fig 6-15 Remote computer settings

(5) Run “msvsmon.exe” in x86 folder at remote computer, in “tool->options” item, change Authentication Mode as “No authentication, Allow any user to debug”, as shown in Fig 6-16.

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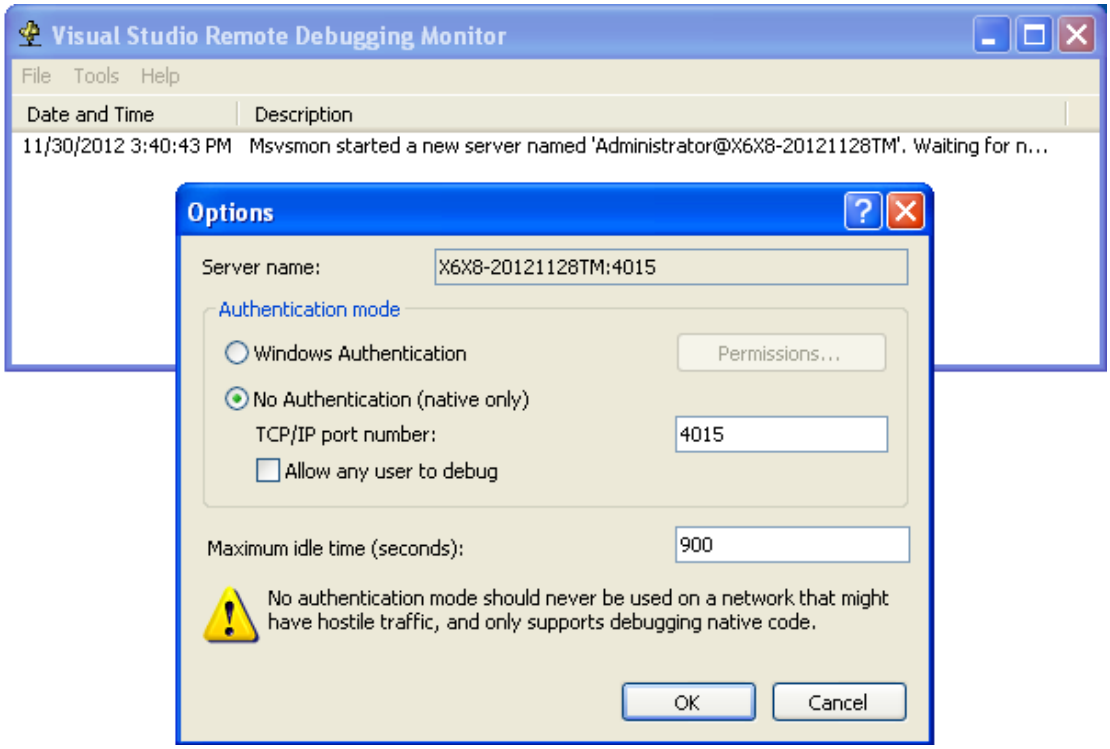

Fig 6-16 Set Authentication mode for remote computer

(6) Create a new MFC project (suggest use MFC in a Static library) at local computer, as shown in Fig 6-17. Set “Project->Properties” at project settings. Set output path as \\192.168.0.2\Debug at “Configuration Properties->general”, as shown in Fig 6-18. Set “Debugging ->debugger to start” as “Windows debugger”, set “Debugging ->Remote command” as \\192.168.0.2\Debug\project name.exe, set “Debugging-> Working Directory” as \\192.168.0.2\debug, set “debug-> Remote Server Name” as “192.168.0.2”, set “Connection” as “Remote with no authentication (Native only)”, the completed dialog box is shown as Fig 6-19.

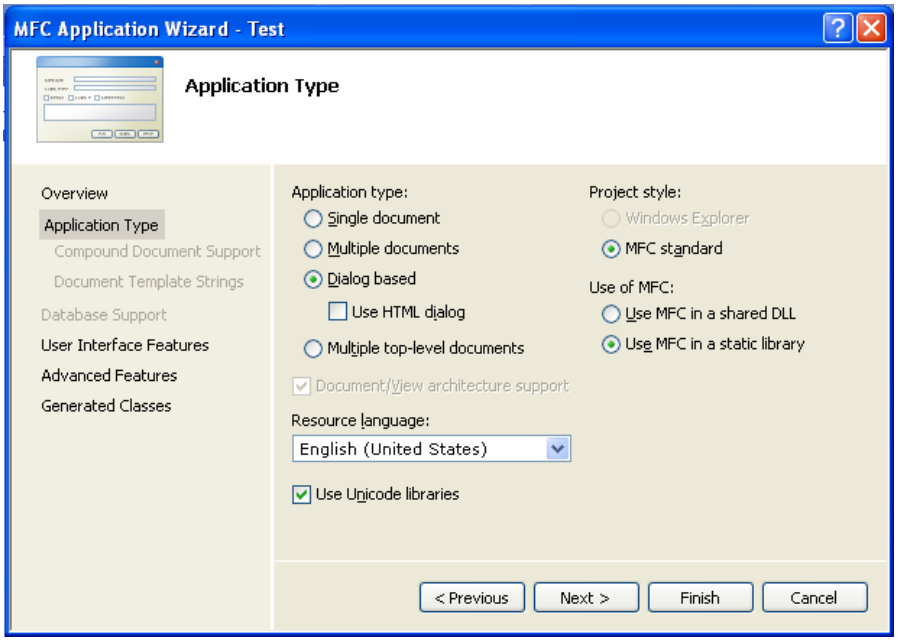

Fig 6-17 Create a new MFC project

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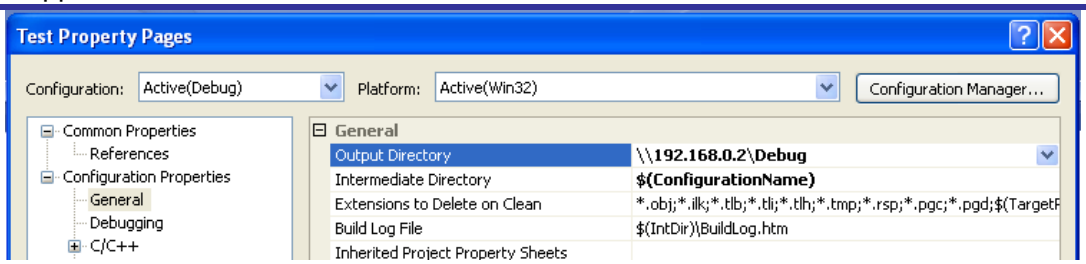

Fig 6-18 Set path at “configuration attribute-> common”

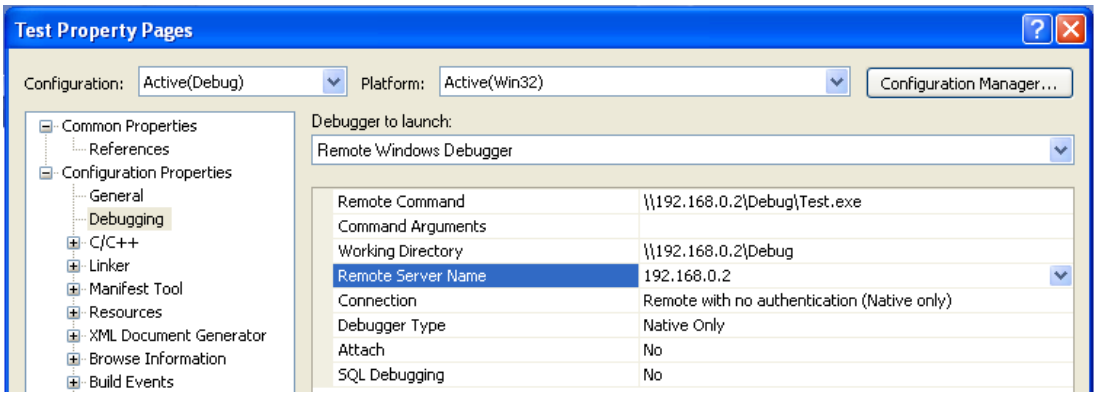

Fig 6-19 Set “configuration attribute-> debug”

After above steps, user can start a debugging, even codes be modified, its unnecessary to copy debug to remote computer.

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6.5 Dimension

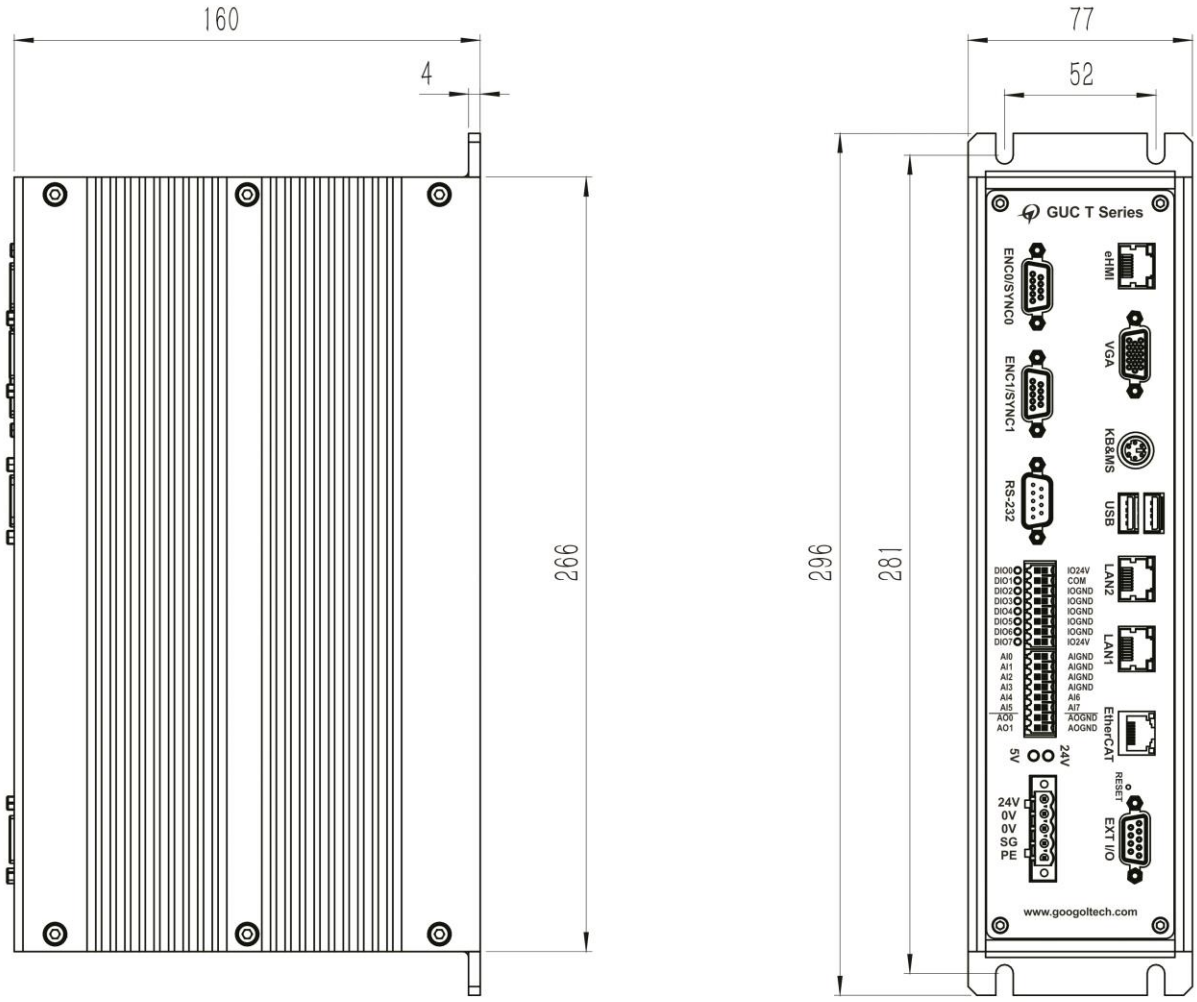

Fig 6-20 Dimension figure of GUC-ECAT motion controller unit(mm)

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